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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
VOL. LXII. No. 1.

NEW NEUROPTEROID INSECTS.

BY NATHAN BANKS.

WITH TWO PLATES.

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM.
MARCH, 1918.

No. 1.— *New Neuropteroid Insects.*

By Nathan Banks.

On the following pages are brought together descriptions of various new species, partly from the United States, partly from foreign countries. Except in the few particularly designated, the types are in the collection of the Museum of Comparative Zoölogy, (Nathan Banks Coll.).

PSOCIDAE.

Psocus longipennis, sp. nov.

Type.— M. C. Z. 10,038. Colo.: Boulder, 30 August. T. D. A. Cockerell. One specimen.

Head brown, shining, a pale spot each side above near eye; antennae dark, not very long-haired; thorax black, shining; abdomen brown; legs pale brownish; wings hyaline; venation dark, stigmal vein brown, stigma a uniform pale brown, very long and slender and broadly rounded behind; discal cell four-sided, basal side convex basally, outer side straight, about twice as broad above as behind, the usual parts of venation hyaline; the radial sector from discal cell to the forking is more strongly curved toward the stigma than in most species.

Length 7 mm. Distinct by very long wings.

Psocus additus, sp. nov.

Type.— M. C. Z. 10,039. N. Y.: Sport Island, Sacandaga River, 27 June, C. P. Alexander; Md.: Beltsville, 9 June. N. Banks. Two specimens.

Black, head rather dull, legs brown, venation black, the usual pale spaces, and besides the radial sector just beyond the connection to median vein is plainly hyaline for some distance (not noticed in any other species); a black, irregular band before middle of wing, ending on the end of anal vein; the outer two thirds of the stigma dark, a faint cloud behind the forking of the radial sector (as in *P. striatus*); stigmal vein pale on basal part; stigma moderately long, nearly angulate behind; discal cell long, four-sided, not much wider at base than at tip; antennae short, pilose.

Length 4 mm.

PSOCUS PETIOLATUS, sp. nov.

Type.— M. C. Z. 10,040. Va.: Falls Church, 30 June. N. Banks. Two specimens.

Yellowish, nasus faintly brown, lineate, palpi pale, antennae blackish; thorax black above, sutures pale; abdomen brownish; legs yellowish. Wings hyaline, an indistinct band before middle, ending on end of anal vein, stigma dark in the outer two thirds; venation mostly dark, the usual hyaline spaces; stigma rather abruptly angulate behind; discal cell four-sided, short petiolate from the radius, outer side straight, inner side convex toward base; antennae with only very short hair.

Length 3.5 mm.

Closely related to *P. bisignatus*, differs in shape of discal cell, larger size, less distinct band on wing, absence of dark behind stigma, and paler nasus.

PSOCUS BILOBATUS, sp. nov.

Type.— M. C. Z. 10,041. Maine: Ft. Kent, 14 August. C. W. Johnson. One specimen.

Coloration similar to *P. purus;* wings longer than *P. purus*, the stigma very much more elongate and slightly rounded behind, a little darker than rest of wing, and containing a small, faint, dark cloud, discal cell with a small dark spot over basal angle, the outer side strongly concave outwardly, so that the cell is five-sided; stigmal vein nearly unicolorous, but rather pale; antennae very long-haired as in *P. purus;* tip of male abdomen very strongly bilobed (Plate 1, fig. 1).

Length 6 mm.

Differs from *P. purus* by longer stigma, unicolorous stigmal vein, spot at base of discal cell, and male genitalia.

AMPHIGERONTIA FORMOSA, sp. nov.

Type.— M. C. Z. 10,042. Queensland: Kuranda. R. C. L. Perkins. One specimen.

Dull yellowish; clypeus in the middle and the nasus brownish, last joint of palpi black; antennae with basal joints and the first long joint yellowish, rest black; three large, shining black spots occupy most of mesonotum; abdomen blackish; legs pale, tips of tibiae and the tarsi blackish. Wings hyaline; veins reddish brown, lower side of radial fork (except near tip), the outer side of discal cell, connecting vein to hind margin, and the anal (except tip) whitish. Stigma moderately long, almost angulate behind; tip of wing almost acute; stigma dark brown, a large apical brown cloud from below stigma out between radius and median and over all the last and most of adjoining posterior cell; a cloud along the subcosta; a large one basad of the discal cell. Hind wings hyaline, basal part rather dusky behind, veins brownish; venation (Plate **2**, fig. 24).

Length to tip of wing 7 mm.

HEMIPSOCUS SELYSI, sp. nov.

Type.— M. C. Z. 10,043. Mid Queensland. R. C. L. Perkins. One specimen.

Pale yellowish. Head broad, vertex rather flat, eyes small, a red line below and one above each antenna horizontally back to the eye, vertex with a red line near each eye, curved in front, divergent lines back from ocelli, and a reddish patch each side; in front of the ocelli are several faint, short, reddish lines. Legs wholly pale, antennae pale, the joints beyond middle rather darkened at base. Wings smoky, darkest near the veins which thus appear margined, these veins broad and pale, the apical ones with some blackish dots and ending in larger black dots; the anal vein, however, is fine and dark colored. Venation (Plate **2**, fig. 19).

Length to tip of wing 4 mm.

TAENIOSTIGMA PERKINSI, sp. nov.

Type.— M. C. Z. 10,044. Mid Queensland. R. C. L. Perkins. One specimen.

Dull yellowish, nasus very much swollen; the antennae pale on the basal part, apical third or half of third and following joints black, the basal third of the fourth and following joints snow-white, tips of tibiae and last joint of tarsi black. Wings hyaline, venation yellowish, no marks, stigma scarcely darker than elsewhere. Wings long, nearly acute at tip; stigma very slender, but tapering to each end; venation (Plate **2**, fig. 23).

Length to tip of wing 6.5 mm.

PERLIDAE.

PERLA INNOTA, sp. nov.

Type.— M. C. Z. 10,045. N. Y.: Ithaca, 8 July. N. Banks. One specimen.

Face marks and antennae like *P. illustris*, also the thorax and legs marked about the same; the abdomen above is nearly wholly yellow, the last segment is darker, but with pale apical margin except a median deep black spot; setae black. Wings hardly discolored; venation quite dark, except costal cross-veins. Anastomosis disjointed, the radial sector beyond is twice forked; about five median and eight cubital cross-veins; branches of anal cell wide apart at base. Related to *P. illustris*, but the female ventral plate (Plate 2, fig. 18) is more pointed, with a notched tip, and convex sides, and shows two dark spots.

Expanse 44 mm.

PERLA TITUSI, sp. nov.

Type.— M. C. Z. 10,046. Idaho: Blackfoot, 22 June. E. G. Titus. One specimen.

Brown; yellow median spot on vertex, connected to median stripe over pronotum, setae yellow at base; antennae brown, palpi dark brown; legs yellow-brown, tarsi darker. Ocelli form a triangle more than twice as broad as long, lateral ocelli much nearer eyes than to each other; lateral bosses small, transverse, nearer to lateral ocelli than to the eyes. Pronotum not one fourth broader than long, sides parallel, angles square, moderately rugose above. Wings lightly infumate, venation yellowish brown; radial sector three-branched beyond anastomosis, the latter continuous, not disjointed; three or four cross-veins beyond end of the subcosta, about eight before, about eight median and cubital cross-veins; radial sector geniculate at origin, branches of anal only slightly curved, and as far apart at base as one half length of outer side of anal cell; outer part of cubitus gives off two branches. Ventral plate (Plate 2, fig. 25).

Expanse 35 mm.

ALLOPERLA INFIRMA, sp. nov.

Type.— M. C. Z. 10,047. Colo.: North Boulder Creek, 22 August; Florissant, 30 August. S. A. Rohwer; Grant, 20 August. E. C. Jackson. Seven specimens.

Pale yellowish (greenish in life), eyes and ocelli black, pronotum rather fumose, the margin black all around except in the middle behind; hind margin of meso- and of metascutellum black; tarsal claws black; venation pale. Ocelli forming a triangle a little broader behind, posterior ocelli plainly nearer to eyes than to each other; pronotum two and a half times as broad as long, sides evenly rounded, surface faintly rugulose; legs slender, tibia I as long as width of the pronotum. Wings moderately long, radial sector one-branched beyond anastomosis, the fork with a long pedicel; about four medio-cubital cross-veins; anastomosis widely disjointed; cubital sector soon runs into hind margin.

Expanse 16 mm.

ALLOPERLA LINEOSA, sp. nov.

Type.— M. C. Z. 10,048. Colo.: Grant, 20 August. E. C. Jackson. Two specimens.

Pale yellowish (green in life), eyes and ocelli black; pronotum with a median black line which is enlarged at each end, and continued back over the middle of the thorax and most of the abdomen; venation pale. Ocelli in an equilateral triangle, posterior ocelli no nearer to eyes than to each other; pronotum twice as broad as long, sides rounded, surface finely rugulose; legs slender, tibia I longer than width of the pronotum. Wings of moderate length, anastomosis widely disjointed, radial sector one-branched beyond, the pedicel long; about three medio-cubital cross-veins; cubital fork soon runs into the margin.

Expanse 14 mm.

TAENIOPTERYX PARVULA, sp. nov.

Type.— M. C. Z. 10,049. Va.: Peach Grove Hill, February; D. C.: Washington, February. N. Banks. Two specimens.

Black; head and thorax densely clothed with minute gray pubescence; legs more brownish. Ocellar triangle fully twice as broad as long, the lateral ocelli only little more than their diameter from the eyes. Pronotum one and two thirds as broad as long, as broad in front as behind, sides parallel; hind tibia of male slightly sinuate. Wings gray fumose, rather darker in stigmal region; no pale band. Costal area with only basal cross-vein; no cross-vein beyond end of subcosta; radial sector with one branch, this just beyond the cross-vein, the anastomosis is continuous and not disjointed, the connection from radial sector to median being nearly straight across (not oblique).

Venter (Plate 1, fig. 2). Male genitalia (Plate 1, fig. 3).

Expanse 17 mm.

TAENIOPTERYX GRINNELLI, sp. nov.

Type.— M. C. Z. 10,050. Calif.: Millard Canon, Pasadena, 10 April. F. Grinnell. Two specimens.

Dull dark brown or blackish; legs and antennae paler yellowish brown, tips of femora, bases and tips of tibiae, and the tarsi darker; male genitalia yellowish. Ocelli form a triangle a little broader than long, the hind ocelli almost twice their diameter from the eyes; pronotum one and a third times as broad as long, broadest just before the middle the sides convex, a few, rather large smooth, raised spots on the disc behind the transverse furrow. Fore wings with a pale band across just beyond the end of the subcosta; the radial sector with but one branch, this shortly beyond the cross-vein; the costal area has the usual basal cross-vein, but no other cross-veins till near the tip. Male hind femora unarmed, and the tibia straight. Male genitalia (Plate 1, fig. 6).

Expanse 20 mm.

TAENIOPTERYX (RHABDIOPTERYX) NIGRIPENNIS, sp. nov.

Type.— M. C. Z. 10,051. Wash.: Wenatchee, 31 May. E. J. Newcomer. Three specimens.

Black, with black wings. Head a little paler near the mouth, tips of tibiae (in ♀) pale; basal costal part of wings pale, and with partly yellowish venation; wings darkest in apical costal part, and near the anastomosis; venter pale, in ♂ the apical plate is pale yellowish with a black superior margin. Costal area with a basal cross-vein, and usually two toward the end of the subcosta, radial sector with one fork, likewise the median and cubital veins end in one fork, the latter hardly more basad than the former; five to six median cross-veins, six to eight cubital cross-veins; the posterior ocelli hardly more than twice as far from each other as from the eyes; pronotum one and a third times as broad as long, sides convex, anterior corners rounded, rather numerous rugosities each side; ventral plate of the ♀ rather broad, broadly rounded at tip. The apical plate of ♂ is long and tapering. Venter ♂ ♀ (Plate 1, fig. 4).

Length 20 mm.

TAENIOPTERYX (RHABDIOPTERYX) PALLIDA, sp. nov.

Type.— M. C. Z. 10,052. Wash.: Wenatchee, 31 May. E. J. Newcomer. Three specimens.

More or less reddish, legs and wings pale. Head dull reddish, paler around mouth, a large black patch above antennae to the posterior ocelli, and behind on vertex blackish, antennae black, palpi pale, pronotum dull blackish in middle, reddish on front, behind, and on sides, rest of thorax and the abdomen blackish, apical part of venter and the ventral plate of female pale. Legs pale, tarsi darker, and femora sometimes infuscate above. Wings grayish hyaline; costa, subcosta, and radius pale, except near tip, other veins brown to black, end of radius rather broadly blackish, a basal costal cross-vein and one or two toward end of the subcosta; about six cross-veins in median and in cubital areas, median and cubitus end in one fork, that of the latter some distance before the former; radial sector with one branch at or just beyond the anastomosis; the female ventral plate (Plate **1**, fig. 7) rather long, broadly rounded at the tip. The posterior ocelli more than twice as far apart as from the eyes. Pronotum nearly one and a half times as broad as long, sides slightly convex, anterior corners rounded, surface with but few rugosities each side.

Expanse 19 mm.

ARSAPINA BAKERI, sp. nov.

Type.— M. C. Z. 10,053. Calif.: mountains near Claremont. C. F. Baker. One specimen.

Black; legs, antennae, and setae yellowish brown, tarsi darker. Head and ocelli similar to *A. decepta*, but a large triangular boss obliquely in front of each lateral ocellus. Pronotum only a little broader than long; sides rather convex; setae fully as long as abdomen, the joints elongate. Wings dark gray, darker along stigmal area and along outer hind margin; pale areas above and behind the anastomosis; cross-vein beyond end of subcosta arises just above the anastomosis, the radial sector at anastomosis almost forks; that is the posterior section of anastomosis is very short; and this branch is very concave near base. The cubital vein has a distinct apical fork. (Plate **2**, fig. 26).

Expanse 17 mm.

EPHEMERIDAE.

EUTHYPLOCIA INTERCALATA, sp. nov.

Type.— M. C. Z. 10,054. E. Colombia: Mediao. A. H. Fassl; British Guiana: Bartica. H. E. Parish; Guyane Française. E. Le Moult. Four specimens.

♀ Resembles *E. hecuba*, about as large, and colored about the same; the costal area toward base is rather darker than in *E. hecuba*. Dorsal abdominal segments pale, with the posterior margin of each darker. It is separated at once from *E. hecuba* by the presence of five pairs of long intercalaries in each fore wing; one pair between lower branch of vein 7 and vein 8, one pair between upper and lower branches of vein 7, one between veins 6 and 7, one between upper branches of vein 6, and one between vein 5 and lower branch of vein 4. Vein 8 has a long branch parallel to it (as in *E. anceps*).

Expanse 50 mm.

CAMPSURUS PARISHI, sp. nov.

Type.— M. C. Z. 10,055. Ecuador: Durar, 21 June. H. S. Parish. Four specimens.

♂ Body pale; head blackish between eyes, dark on metanotum, and at tip of abdomen; legs of front pair blackish, their claws white, and nearly as long as last tarsal joint; setae wholly pale. Costal veins heavier and grayer than others so that the costal area appears darkened, rest of wing whitish hyaline with white venation. Vein 8 has one branch which soon forks, but few if any cross-veins between these forks nor to the hind margin of wing. The male genitalia (Plate 1, fig. 5) shows the middle pair of appendages very long, more than half as long as the lateral ones.

Expanse 24 mm.

THRAULUS TRIJUNCTA, sp. nov.

Type.— M. C. Z. 10,056. Peru: Lima, 21 August. H. S. Parish. Two specimens.

Head black between eyes; thorax brown, sutures and ridges on sides white; pronotum white on sides; tip of scutellum pale, basal abdominal segment dark brown, next five segments very pale, each with a dark dot each side, seventh segment dark brown in middle, pale each end and on the sides, eighth with median dark line and basal band, ninth rather darker with dark median stripe, tenth dark except apical and lateral margin; setae pale, every fourth segment wholly dark, the joinings between dark (Plate 2, fig. 20); all femora with a rather broad preapical band, femur I of male with subbasal band also, and the tip of tibia dark. Wings hyaline; veins mostly yellowish or pale brown, great cross-vein broadly black, no cross-veins in basal costal area, 10 or 12 in apical part, most of the cells of wing twice as long as broad, no true intercalaries.

Expanse 16 mm.

CALLIBAETIS NIGRIVENOSA, sp. nov.

Type.— M. C. Z. 10,057. Ecuador: Huigar, 4,500 ft., 17 June. H. S. Parish. One specimen.

Rich dark brown; abdomen near tip with pale on sides of segments; legs pale. Wings with a faint dark tinge, very deep and prominent on apical costal area; all veins very dark brown or nearly black; margin with two moderately long intercalaries in each space; about 10 or 12 cross-veins in costal area; two series of discal cross-veins, about 5 or 6 in the inner series, about 15 in outer series, but none of these anywhere near margin, many as near to inner series as to margin.

Expanse 24 mm.

CALLIBAETIS SIGNATA, sp. nov.

Type.— M. C. Z. 10,058. Ariz.: Williams, 24 July. H. S. Barber. Two specimens.

♀ Pale brownish; scutellum pale in middle; abdomen dotted; setae pale, with the joinings dark; legs pale, tarsi and tibiae at tips rather darker. Wings hyaline, longitudinal veins brown, cross-veins hyaline, none near the hind margin; various pale brown spots along costal region but not forming a continuous stripe; several costal dots, a basal streak, one just before middle of wing on subcosta and radius, and three or four beyond, several other brown spots.

♂ Rather darker brown, the abdomen shows above two large pale spots, one over the penultimate segment, and the other on the third segment before the last, between these spots the dorsum is nearly black; venter finely dotted. Wings hyaline, no spots, longitudinal veins brown, others hyaline.

Expanse 15 mm.

CALLIBAETIS NIGRITA, sp. nov.

Type.— M. C. Z. 10,059. Colo.: Boulder, May. T. D. A. Cockerell. One specimen.

♂ Dark brown; back of thorax blackish; abdomen dotted, the dorsum with a median darker stripe, on the last few segments this darker stripe is pale in the middle; venter with a pair of dark submedian stripes on each segment; front legs very dark, others pale, femora before tip and the tarsi darker; male genitalia and the setae pale yellowish. Wings hyaline, veins white, the longitudinal ones with some black streaks, hind margin alternately dark and pale; many cross-veins, a number near the hind margin. The male with costal area marked with black (not brown) spots, but not forming a continuous streak; various dots along costal margin, streaks along veins, and larger spots beyond the middle, two being larger than others.

Expanse 20 mm.

HEMEROBIIDAE.

NOSYBUS NAVASI, sp. nov.

Type.— British Museum. Africa: Gold Coast, Aburi. Patterson coll.

Face yellowish, clypeus brownish, vertex with tufts of long white hairs, also on the pronotum; antennae as long as width of fore wings, curled, tapering to tip, rich brown in color. Abdomen brown, with median lobes above, with sparse white hair above and denser yellowish hair on sides; the ovipositor yellowish, about one third the length of the abdomen; legs pale, tarsi yellowish, basal half of hind tibia and apical part of middle tibia dark, legs with mostly long white hairs, but some dark ones. Fore wing with two faint broad oblique gray bands, one before middle, one at the middle, and several large patches beyond, the space between these marks snow-white; the cross-veins black, and black haired, and a black spot at anal angle, other veins mostly yellowish, with long hairs, mostly white, but some in costal area are black. Venation very similar to *N. nobilis* Navas, but a cross-vein connecting the second and third branches of the radial sector toward tip, thus four veinlets in the outer series of gradates; hind wings similar to *N. nobilis*, but no cloud back of the stigma, the latter very distinct. Veins similar to *N. nobilis*, but the extra apical cross-vein, the lack of cloud in hind wings, several details in color of legs, as well as different locality lead me to consider it a distinct species.

Expanse 15 mm.

Navas has placed this genus in the Hemerobiinae, but its extreme likeness to Dilar, leads me to think it is very near that genus and that the male will have pectinate antennae. It has no close affinity to Neurothus, except the one radial sector, a character of no great value, and liable to variation in the Hemerobiidae.

NOTIOBIELLA COSTALIS, sp. nov.

Type.— British Museum. Africa: Gold Coast, Aburi. Patterson coll.

Pale greenish yellow (doubtless green in life); veins green, practically all the forkings (except the marginal ones) clouded, the cross-veins margined, and several other clouds in the cells, one series forming a faint band some distance before the tip; hind wings unmarked. Fore wings about two and a fourth times as long as broad, the costal area extremely broad; at origin of the first radial sector the costal area is nearly as broad as the rest of the wing at that place, the middle series of cross-veins not very oblique, and disjointed. In hind wings the radial sector forks twice before the stigma.

Expanse 11 mm.

Its broad costal area and shape of superior appendages of the male (Plate 2, fig. 21) separate it from the other described African species of the genus.

CHRYSOPIDAE.

LEUCOCHRYSA CLYSTERA, sp. nov.

Type.— M. C. Z. 10,060. Colombia: San Antonio, 6,000 ft., February. A. H. Fassl. One specimen.

Runs to *L. montanola* or *neuralis* in Navas table; having radial sector in fore wing partly black; differs from both in pronotal marks, and other points. Face yellowish, unmarked; palpi pale; antennae pale, no distinct stria on the basal joint, a large reddish, median, triangular mark on the vertex; pronotum with a reddish spot at each anterior corner, a large reddish, transverse mark on middle of each side, and the hind border narrowly reddish; eight reddish spots on meso- and metanotum forming two rows; abdomen with transverse reddish marks on several segments near the base; legs pale. Wings with green venation; in fore wings the gradates, many costals, origin of radial sector, and cross-vein to median, the divisory and bases of second, third, and some other cubital cells wholly black; radials in part, and origin of branches of the radial sector, and most of the marginal forks in part, black. In the hind wings the gradates, and part of marginal forks dark; stigma not distinct in either pair. Wings large and broad, hind wings acute at tip; gradates subparallel, inner (of seven or eight) scarcely nearer to the radial sector than to the outer (of six or eight), the veinlets not much disjointed; third cubital cell of moderate length, tip oblique; marginal forks over three times as long as broad; 20 costals before stigma in fore wing. Pronotum rather longer than broad, tapering in front.

Expanse 44 mm.

Leucochrysa minima, sp. nov.

Type.— M. C. Z. 10,061. Colombia: Caldras, 4,400 ft., May. H. S. Parish. Three specimens.

Pale yellowish; face, palpi, and antennae unmarked, no marks on pronotum or rest of thorax; wings with green venation; in fore wings the radial sector in part, the gradates, some of the costals, the radials in part, and sometimes parts of other veinlets, dark; in hind wings the gradates are dark; stigma dark green, in hind wings with brown spot at the base. Wings rather long, in hind pair acute at tip; gradates subparallel, five in inner, six in outer series, veinlets widely separated, the inner series much closer to the radial sector than to the outer series; marginal forks two and one half times as long as broad, 16 costals before stigma, divisory arising very near to cubitus, third cubital cell not very long, wide at tip. Pronotum much broader than long.

Expanse 26 mm.

Leucochrysa clepsydra, sp. nov.

Type.— M. C. Z. 10,062. Colombia: Caldras, 4,400 ft., May. H. S. Parish; Inmbo, Cauca, 3,000 ft., January. A. H. Fassl. Four specimens.

Runs to *L. azevedoi* or *stictocera* in Navas table of South American species, having part of radial sector in both wings black, and a blackish margin to hind wings; it differs at once in the pale antennae, not marked with dark on the basal part. The face shows only a faint reddish streak on each cheek, the palpi pale, antennae pale, the basal joint with a superior reddish stria; pronotum with two reddish spots on each side margin. Wings with green venation, marked with black, in fore wings the gradates, and marginal forks black, and part of the costals, radials, and branches of radial sector dark at one or both ends, origin of radial sector black; in hind wings the gradates are not dark, the marginal forks partly dark, and the marginal vein black on outer portion; stigma in hind wings distinct, hardly so in the fore wings; both wings broad; seven or eight gradates in each series in each wing, the series nearly parallel, and the inner series rather nearer the radial sector than to the outer series; third cubital cell very long (in *L. azevedoi* very short); about 25 costal cross-veins in fore wing before the stigma.

Expanse 40 mm.

CHRYSOPA NIMBOSA, sp. nov.

Type.— M. C. Z. 10,063. Central Africa: Oubangui, Chari-Tchad, Bangui. E. Le Moult. Two specimens.

Close to *C. conradtina* Navas; the wings spotted as in that species, also the head and antennae so marked. In the wings the stigma is not so distinct, only black-bordered veins, and in the hind wings the stigmal band is more interrupted. In both wings the discal veins and those near middle of hind border are margined with pale yellowish brown; and in several cells so margined behind the stigma the central area is silvery white; the thorax has a broad black band across between the bases of both pairs of wings. Venation as in *C. conradtina.* The abdomen has the last two dorsal segments black, and a median black stripe on dorsum to middle of length.

CHRYSOPA SUBMARGINATA, sp. nov.

Type.— M. C. Z. 10,064. Peru: Lima, 12, 20 August. H. S. Parish. Two specimens.

Green or yellowish. Cheeks with red stripe from eyes to mouth; palpi marked with black, the antennae all pale, behind the eyes there is a red line to the pronotum, latter with a red stripe each side but remote from the side margin; anterior lobe of mesonotum with red spot each side; legs pale. Wings with green venation, many cross-veins marked with black, the gradates, ends of costals and radials, several near base of wings, and some branches of radial sector and cubitus black at origin. Wings long, acute, gradates very oblique, parallel, each of six veinlets, inner as near outer series as to the radial sector, marginal forks two and one half times as long as broad, about 20 costals before stigma, divisory ends beyond the cross-vein; in hind wings three inner and seven outer gradates, these black, other venation green, stigma in both pairs very long, deep green. Pronotum slender, about one and one half as long as broad, tapering in front.

Expanse 33 mm.

Chrysopa hestia, sp. nov.

Type.— M. C. Z. 10,065. Argentina. E. LeMoult. One specimen.

Runs to *Ch. gonzalezi* but differs in markings of wings, and more especially in the position of the inner gradate series, which is placed nearly transversely across the wings. Face yellowish, a faint reddish stripe on each cheek, last joint of palpi marked with dark, antennae pale, vertex green, thorax and abdomen deep green, pronotum with side margins red, and also the sides of thorax above base of wings; legs pale; wings with green venation, in fore wing the stigma dark at base and faint clouds along the outer four cross-veins between radius and radial sector, both gradate series and the last branch of the radial sector to median vein margined with pale brown; hind wings unmarked, except the stigma is a darker green. Wings are moderately slender, nearly acute at tips, the divisory ending before the cross-vein, the outer gradate series of six veinlets curved as to be nearly parallel to the outer margin, the inner series of five veinlets nearly transverse, none much disjointed; marginal forks fully three times as long as broad; about 16 costals before the stigma in fore wings; in hind wings the gradates, of five and six veinlets, are subparallel, and more oblique than in the fore wings. Pronotum a little longer than broad, narrowed in front.

Expanse 24 mm.

Myrmeleonidae.

Dendroleon sumatranum, sp. nov.

Type.— M. C. Z. 10,066. Sumatra: Medan, Doloc Baros Estate, May. E. Le Moult. One specimen.

Face and vertex yellowish brown, latter only very indistinctly marked; antennae also yellowish brown, darker toward tip; pronotum brown, not marked, rest of thorax and abdomen pale yellowish brown; legs pale, tarsi dark, and tips of femora and tibiae also. Wings pale, with pale venation; several large dark rounded spots on each wing and on fore wing other smaller spots, but all are very faint (perhaps the specimen is teneral). In the hind wing are five large spots, three behind radius, one near base, one before middle and one just before stigma, another large one behind the latter and behind the median vein, and a large one at tip, partly broken by pale; along outer hind margin are three smaller dark spots. In fore wing the stigma is dark, and about four spots of medium size behind the radius, and four or five smaller spots, a number along the outer and hind margin, several along the cubitus and median veins, and one or two near tip. Antennae longer than the head and thorax together, not strongly clavate; pronotum but little longer than broad; legs very slender, the tibia a little longer than femur, the basal tarsal joint as long as the next three together, spurs as long as two joints. Wings broad at stigmal region, very filmy, and very densely veined; at least 75 costals before stigma in fore wing, all simple; radial sector with twelve branches; three cross-veins before radial sector in fore wing, one in the hind wing; about 18 or 20 cubitoanal cross-veins in fore wing; in hind wings the anal runs into the cubital fork; marginal venation extremely dense.

Expanse 76 mm.

Glenoleon conspersum, sp. nov.

Type.— M. C. Z. 10,067. Queensland: Herbeton, 11 February. F. P. Dodd. One specimen.

Face yellowish; a large interantennal black mark from eye to eye, rather convex below, and straight across above; antennae dark, not banded; vertex brown, with four black spots in a transverse row, and in front two transverse lines; pronotum mostly black, a faint median line, two rounded submedian spots each side on front part, and two oblique sublateral spots on posterior part, all pale; a pale spot on median lobe each side, and pale streaks near and extending on the mesoscutellum; metanotum with a pale streak each side. Abdomen black, faint pale median marks on some of the segments. Femora black, tibiae of front and middle pairs banded with pale near base, before middle, and again toward tip; basal tarsal segment pale, rest, dark; hind tibia pale, dark at tip, hind tarsi marked as others. Wings hyaline, veins mostly black, many of them in the fore wings margined with dark, in apical part and behind very densely so; a large spot under stigma, an interrupted dark streak between subcosta and radius; the spots along cubitus rather larger than the others. In hind wing there is a broad stigmal band and a square costal spot beyond dark. The wings are rather broad at stigmal region, tip (Plate 2, fig. 22) acute; near stigma the radial sector bends up to radius as in other species; three cross-veins before radial sector in fore wing, one in hind wing, twelve or thirteen branches of radial sector, costals not forked except near the stigma, in cubito-anal area several of the cross-veins are crossed. In general the venation is similar to *G. radiale.*

Expanse 68 mm.

I had labeled this as doubtfully *G. falsus*, but Petersen's recent figure of that species shows this to be distinct in the heavily spotted fore wings, and the large spot beyond stigmal band in the hind wings.

PANORPIDAE.

PANORPA INTERRUPTA, sp. nov.

Type.— M. C. Z. 10,068. N. Car.: Raleigh, late September. F. Sherman. Three specimens.

Pale yellowish; antennae (beyond basal joints) black; wings hyaline, a trifle flavescent toward base, marked with black much as in *P. venosa* and *P. virginica.* A fairly broad apical band, a narrow stigmal band, broadly interrupted near middle, two subbasal and a basal spot, and a few other smaller marks; veins mostly dark; the subcosta and most of the radius flavescent; subcosta reaching to the stigma. Male abdomen and genitalia very similar to *P. virginica;* the horn on fifth segment slender, curved and remote from tip as in that species. The uncus is longer than in *P. rufescens;* the harpe is not so long as in *P. virginica;* the clasper has on the upper side a ridge with an apical fringe of hair curving over the uncus; this ridge is similar to but much smaller than in *P. virginica.*

Expanse 22 mm.

In appearance similar to *P. rufescens*, but in genital structure related to *P. virginica;* the broken stigmal band separates it from *P. virginica.*

LIMNEPHILIDAE.

LIMNEPHILUS SANSONI, sp. nov.

Type.— M. C. Z. 10,069. Alberta: Banff. N. B. Sanson. Three specimens.

Group of *L. combinatus*, but more heavily marked with dark. Yellowish, with gray or yellowish hairs; abdomen black, venter paler; front tibiae with mostly yellow spines. Wings yellowish; fore wings heavily marked with brown behind and on the outer part, and a very dark spot at stigma; the two oblique spots on middle across cubitus are very distinct, a large clear spot in base of apical and first subapical cells, and another over apical parts of fifth apical and first and second subapical cells; a dark streak along the second anal vein. All the dark brown is broken by rounded hyaline spots. Venation as in *L. combinatus*, but the fore wings not as elongate. The superior appendages of female are similar to those of *L. combinatus*, but the intermediate ones are shorter than in that species, and more acuminate. In the male the superior appendages seen from the side slope more behind, and the lower inner edge not armed with such large teeth as in *L. combinatus;* the intermediate superior appendages are much larger than in *L. combinatus*. From *L. oslari* the female differs in the much longer superior appendages, and in the male the superior appendages are nearly the same shape, but in *L. oslari* they are very heavily armed with teeth on the inner surface toward tip, while here they are scarcely armed at all; in *L. oslari* the intermediate superior appendages are smaller and with slightly curved tips. (Plate 1, fig. 8).

Expanse 34 mm.

Most of the specimens seen appear much like normal *L. externus*, but not closely related to that species.

LIMNEPHILUS ROTUNDATUS, sp. nov.

Type.— M. C. Z. 10,070. Calif.: Lake Tahoe. W. K. Fisher. One specimen.

In general marked as in *L. gravidus* Hagen, the tibiae and tarsi being banded with dark; the fore wings rather more heavily marked than the normal *L. gravidus*, but on the same plan; the oblique pale spots across the cubitus being distinct; the outer margin of fore wing nearly truncate. Venation like that of *L. gravidus*. The female differs at once from *L. gravidus*, *L. vastus*, and *L. intermedius* in having the inferior appendages short and rounded (instead of triangular); the superior appendages are about as stout as in *L. intermedius*, with the tip slightly pointed and turned upward (Plate **1**, fig. 14).

Expanse 42 mm.

LIMNEPHILUS INTERMEDIUS, sp. nov.

Type.— M. C. Z. 10,071. Wash.: Olympia. T. Kincaid. One specimen.

In general similar to *L. gravidus* Hagen the tibiae and tarsi banded with dark. The fore wings are rather more evenly marked with dark, a heavy dark band over the anastomosis; shape of wings and venation as in that species, the outer margin being a little convex, and the fourth apical cell in both wings being nearly as broad at base as the third. The female differs from *L. gravidus* in the genitalia, (*cf.* Plate **1**, fig. 11, 12) the superior appendages being much broader and heavier, but less acuminate than in *L. vastus* (Plate **1**, fig. 13).

Expanse 46 mm.

LIMNEPHILUS FLAVASTELLUS, sp. nov.

Type.— M. C. Z. 10,072. British Columbia: Wellington. T. Bryant and D. Jones. Two specimens.

Yellowish, with whitish or golden hair, leg I blackish on anterior side of femur and posterior side of the basal tarsal joints; the hind tibiae rather brownish, spines black, a few on front tibiae near base may be yellowish. Fore wings yellowish, darker yellowish brown on posterior half and on outer part; a large hyaline spot beyond anastomosis, and a curved hyaline streak above the median vein and curving back to cubitus, the brown by the hyaline streak is darker than elsewhere and sharply limited, hind wings hyaline, all veins yellowish. Shape of wings and venation like *L. sitchensis*, except that the fourth apical cell in both wings is not so much narrowed at base. In the male the lower appendages have a lobe near tip. Genitalia (Plate **1**, fig. 16, 17).

Expanse 33 mm.

HESPEROPHYLAX MAGNUS, sp. nov.

Type. —M. C. Z. 10,075. Ariz.: Palmerlee, Cochise Co. C. R. Bièderman; Calif.: Santa Ana River, San Bernardino Mts., 30 July,

J. Grinnell; Fish Creek, San Bernardino Mts., 20 June. J. Grinnell; Tanquitz Valley, 19 July. F. Grinnell; N. Mex.: Ft. Wingate, 21 Aug. J. Woodgate; Utah: Stockton, 22 July. T. Spaulding; Colo.: South Park, 20 Aug., E. J. Oslar. Nine specimens.

Colored and marked as in *H. occidentalis*, but the apical part of the silvery stripe has the sides more nearly parallel, not narrowed at tip, and this stripe is more strongly margined than usual in *H. occidentalis*. All the specimens are larger than *H. occidentalis*. It is at once separated in that the superior appendages of the male are excised on outer edge, with the lower part prolonged; and in the female by having the superior appendages much broader and broadly rounded at tip (*cf.* Plate **1**, fig. 9, 15).

Expanse 45 to 50 mm.

RHYACOPHILIDAE.

RHYACOPHILA ALBERTA, sp. nov.

Type.—M. C. Z. 10,073. Alberta: Banff, 27 September. N. B. Sanson. One specimen.

♂ Brown, clothed with black hair on face, yellowish on vertex and pronotum, tufts of black hair at base of wings; antennae brown, narrowly yellow at tips of the joints; abdomen beneath and genitalia yellowish. Legs yellowish, front and mid tibiae dark on basal half, very pale beyond, front and mid tarsi brown. Wings gray, fore wings rather densely marked with blackish spots and streaks, and with many pale, mostly rounded spots, some along margin; hind wings with tips of some apical veins darker. Maxillary palpi with second joint extremely long and slender; abdomen with long, sparse, fine, erect, white hairs on upper surface, as long as width of abdomen. Fore wings rather elongate; fork 2 reaches before fork 1, fork 4 as long as its pedicel; genitalia similar to *R. bipartita*, but there is only a minute rounded superior piece visible, and the internal parts are different (Plate **1**, fig. 10).

Expanse 21 mm.

HYDROPSYCHIDAE.

ARCTOPSYCHE PHRYGANOIDES, sp. nov.

Type.— M. C. Z. 10,074. Alberta: Banff. N. B. Sanson. One specimen.

Face pale, with black hair, front and vertex black, with yellowish hair; palpi pale, antennae pale, tips of joints dark; thorax pale through the middle, dark on sides, pleura pale; abdomen blackish, venter pale; legs pale. Wings longer and more slender than usual; fore wings densely irrorate with dark gray, becoming blackish on the larger spots and on the veins; the larger spots are over the anastomosis, and along the cubital and anal veins. The venation about as in *A. grandis,* but the cells narrower, and especially the apical cells, the outer margin is thus more oblique. The hind wings brownish, nearly uniform, but with a few pale spots on outer costal border; venation as in *A. grandis,* but the pedicel of fork 3 has a spurious vein (really fold) obliquely to the base of fork 2.

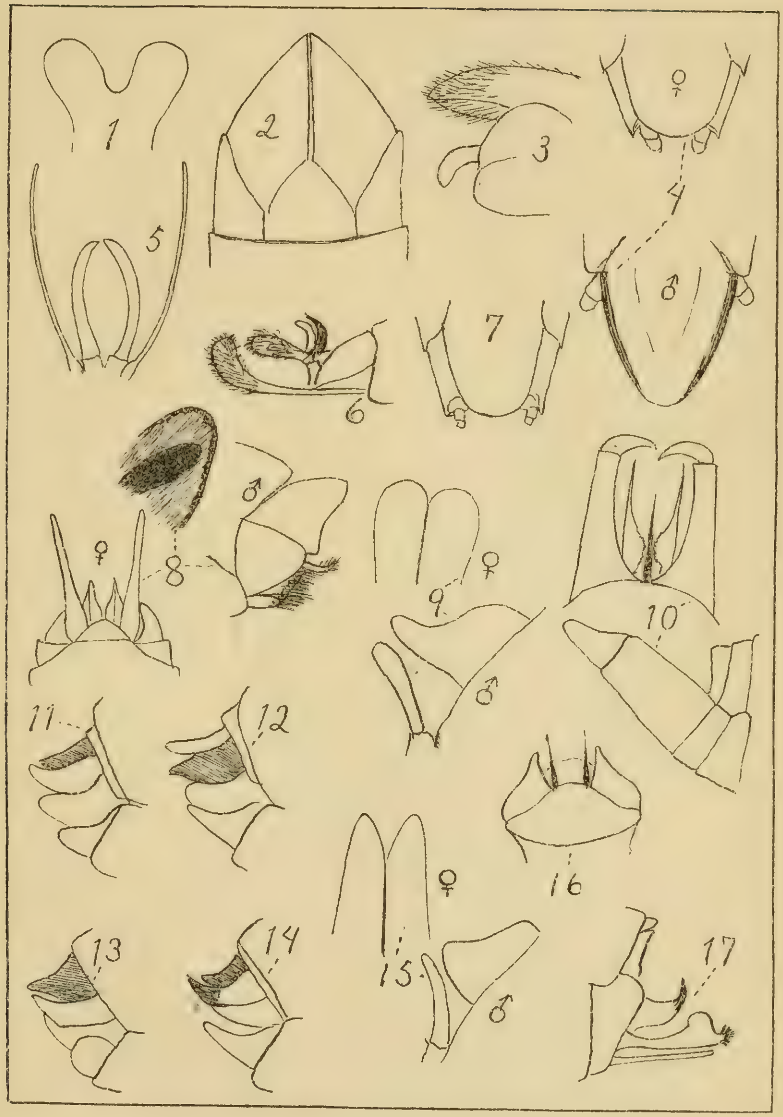
Expanse 38 mm.

Known at once by elongate, heavily irrorate fore wings; probably referred to by McLachlain, Monog. Revis., p. 379, in a footnote.

EXPLANATION OF THE PLATES.

PLATE 1.

Fig. 1. Psocus bilobatus, tip of male abdomen.
Fig. 2. Taeniopteryx parvula, venter.
Fig. 3. Taeniopteryx parvula, side of ♂ genitalia.
Fig. 4. Taeniopteryx nigripennis, venter ♀ above, ♂ below.
Fig. 5. Campsurus parishi, ♂ genitalia.
Fig. 6. Taeniopteryx grinnelli, ♂ genitalia.
Fig. 7. Taeniopteryx pallida, ♀ venter.
Fig. 8. Limnephilus sansoni ♀ genitalia above, ♂ from side and inner surface superior appendage of ♂.
Fig. 9. Hesperophylax magnus, ♂ ♀ genitalia.
Fig. 10. Rhyacophila alberta, ♂ genitalia from below and from side.
Fig. 11. Limnephilus intermedius, ♀ genitalia.
Fig. 12. Limnephilus gravidus, ♀ genitalia.
Fig. 13. Limnephilus vastus, ♀ genitalia.
Fig. 14. Limnephilus rotundatus, ♀ genitalia.
Fig. 15. Hesperophylax occidentalis, ♂ ♀ genitalia.
Fig. 16. Limnephilus flavastellus, ♀ genitalia from above.
Fig. 17. Limnephilus flavastellus, ♂ genitalia from side.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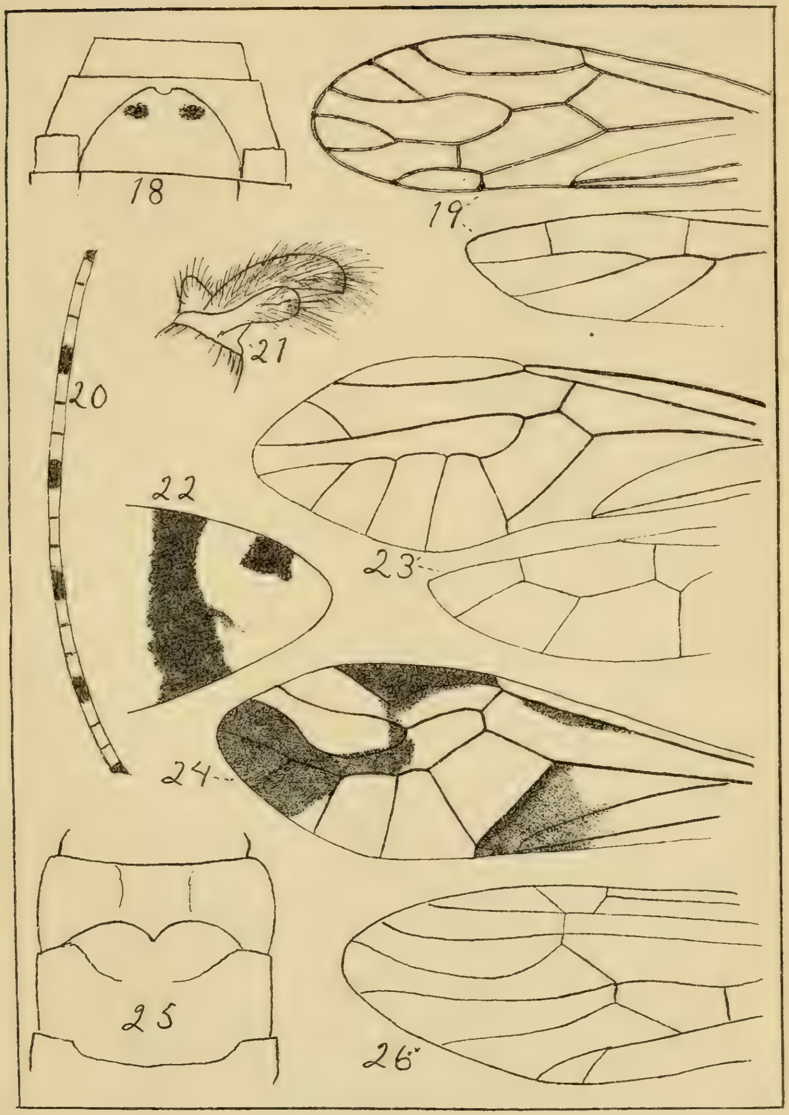
HELIOTYPE CO. BOSTON

PLATE 2.

PLATE 2.

Fig. 18. Perla innota, ventral plate, ♀.
Fig. 19. Hemipsocus selysi, wings.
Fig. 20. Thraulus trijuncta, seta.
Fig. 21. Notiobiella costalis, genitalia, ♂.
Fig. 22. Glenoleon conspersum, tip hind wing.
Fig. 23. Taeniostigma perkinsi, wings.
Fig. 24. Amphigerontia formosa, fore wing.
Fig. 25. Perla titusi, ventral plate, ♀.
Fig. 26. Arsapnia bakeri, fore wing.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HELIOTYPE CO. BOSTON

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NOTES ON A COLLECTION OF SURINAM BIRDS.

By Outram Bangs and Thomas E. Penard.

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No. 2.— *Notes on a collection of Surinam Birds.*

By Outram Bangs and Thomas E. Penard.

Introduction.

The birds here listed were collected during 1912, 1913, and 1914, at a suggestion made by one of the writers to his brother, Mr. A. P. Penard of Paramaribo. The latter, through the services of three Indians, Saka, Pishot, and Maipuli, and of several hunters, especially the brothers Graanoogst, brought together the present collection of nearly 2,000 specimens representing 301 species.

The skins were prepared by the Misses Charlotte Rijhiner, Georgetina Lennep, and also by Miss Anna Maria Hunsel who assisted Messrs. F. P. and A. P. Penard in preparing the specimens on which they based their work on the birds of Guiana.

All the birds were taken within the boundaries of Surinam, and none more than 50 kilometers from the coast. By far the greater number were taken near the capital, Paramaribo, some even within the limits of the city. Many were collected in the Para districts further inland, and a number on various expeditions to the mouths of the Marowijne (Maroni) and Saramacca rivers.

List of localities.

Paramaribo	District	Beneden	Suriname
Vicinity of Paramaribo	“	“	“
Fort Nieuw Amsterdam	“	“	“
Pomonakreek	“	“	“
Braamspunt	“	“	“
Saramaccapolder	“	Beneden	Saramacca
Herminabank	“	Coronie	
Motkreek	“	Cottica	
Tijgerbank	“	Marowijne	
Lelydorp	“	Beneden	Para
Altonaweg	“	“	“
Javaweg	“	“	“
Wanaweg	“	“	“ (?)
Libanonweg	“	Boven	Para
Rijsdijkweg	“	“	“
Overtoom	“	“	“
Topibo	“	“	“

The localities in the Para districts are along the line of the railroad running between Paramaribo and Republiek. We are not certain whether Wanaweg lies in Beneden Para or Boven Para, but it is not far from Lelydorp, formerly known as Koffiedjompo.

The term "Vicinity of Paramaribo" embraces the city of Paramaribo with its outlying wards ("Buitenwijken") and all the surrounding estates and plantations within easy walking distance from the city. The majority of birds so marked were taken by Egbert Graanoogst near his place on the Tweede Rijweg.

Three fairly distinct zones characterize and influence the distribution of bird-life in Surinam. These zones are not sharply defined, and run approximately parallel to the coast line; but although each, in general, presents a distinctive character, the local plant-life depends more directly upon the immediate surroundings, irrespective of the zone in which it may lie. Thus in the midst of the swampy lowlands one encounters dry stretches of a slightly higher level on which the plant-life takes on the aspect of the high woods of the interior, while the lower wet areas of the savannas, and even of the highlands, are covered by a wilderness similar to that of like areas in the coastal region.

The first zone, comprising the Alluvial lowlands, forms a broad belt about 60 kilometers wide, narrower at the Marowijne, wider at the Corentijn, consisting of a low swampy wilderness, the so-called salt-water and fresh-water "pans," and the wet savannas, traversed by higher sandy ridges and old mussel-beds, many of which are partially or wholly submerged during the big rainy season. These ridges and higher levels are covered by growths of mixed character in which high woods similar to those of the back lands prevail. The city of Paramaribo stands upon one of these ridges. The mangrove forests occupy strips of low coast-land and the banks of rivers and "creeks" so far as they are affected by the high tides.

The second zone, the Savanna lands, occupies a narrower belt behind the high woods of the more elevated portions of the lowlands. The sandy surface is not flat but rolling, with here and there small hillocks, some of which are covered by a low growth, while others are bare. Large tracts of grasslands are characteristic of this region. Outcroppings of granite rock are here and there exposed, causing rapids and small waterfalls in the rivers. The creeks which traverse these savannas are bordered by strips of vegetation, usually of low growth, and between the hills are frequently oases of higher growth. This zone forms a transition from the Alluvial lowlands to the Highlands of the interior. Through the Savanna lands may be traced the original coastline of Surinam.

The third zone, the Highlands, emerges gradually and unevenly from the savannas and stretches forth through the little known and largely unexplored back lands to the Tumuchumac Mountains on the Brazilian boundary. Commencing in 1901, several scientific expeditions under the auspices especially of the Royal Dutch Geographical Society, have penetrated to the sources of the main water-ways. But the primary object of these expeditions was to gain geographical and geological information; biological and ethnological work, in most cases, was considered of secondary importance, and especially zoölogical collecting received very little attention. The territory between the upper reaches of the rivers and beyond is still for the most part unexplored and forms a considerable proportion of the total area of Surinam. The extensive hard-wood forests which occupy these parts, are crossed by low mountain-chains and isolated peaks. The highest of these are the Wilhelmina and Emma chains at the source of the Coppename, attaining a maximum height of 1,270 meters. At these comparatively low altitudes we would hardly expect to find an avifauna of the Subtropical zone, but we may look with confidence for a richer representation of tropical species than in the lowlands, and valuable results are sure to be obtained from thorough scientific investigation. The extreme difficulties to be overcome, however, make it very unlikely that any extensive work will be done here for some time to come.

Four seasons, which more or less influence the local distribution of birds, are recognized. They are as follows, but the dates given are very elastic:

1. Little Rainy Season, November 15 to February 15.
2. Little Dry Season, February 15 to April 15.
3. Big Rainy Season, April 15 to August 15.
4. Big Dry Season, August 15 to November 15.

The wettest months are May and June; the dryest September and October. The highest temperature at Paramaribo very rarely reaches 36° C., in the shade, and the lowest 17° C. Further inland the temperature registers a few degrees higher.

The distribution of bird-life is influenced, often to a considerable degree, by local conditions, directly or indirectly caused by the presence of man. Large or small settlements, villages, open fields, cultivated lands, abandoned clearings, and plantations partially reclaimed by nature, second growths, burned woodlands in various stages of recovery,— all are more or less important factors in the distribution of bird-life. In addition to topographic features and to the usual daily or seasonal movements which determine the presence of a species in the lowlands, we must reckon with the occasional abnormally wet or dry seasons, when certain species, perhaps never before or since seen near the coast, suddenly appear in large numbers, even in the more populous parts of the city.

Thus while the present collection may be considered fairly representative of the lowland avifauna of Surinam, many species are missing which might have been obtained had the collector's efforts been exerted over a larger area for a longer period. Also some which are abundant at the coast, and not rare near Paramaribo, a few even common in the city, are not represented; no doubt these could easily have been included in the collection had a special effort been made to obtain them.

The arrangement of families is that used by Ridgway in the Birds of North and Middle America, but beginning with the least specialized forms. In the sequence of genera, species and subspecies, we have followed Brabourne and Chubb in their Birds of South America. Type-localities have been omitted whenever they are correctly stated by Brabourne and Chubb.

All measurements are in millimeters. Tail-measurements, unless otherwise stated, are from the base of the free tail-feathers to the extreme tip.

In going over the collection, it was necessary to examine much material from South and Central America, and the results are included in the present paper.

SUMMARY.

List of species and subspecies described as new.

Milvago chimachima cordata	San Miguel Island, Bay of Panama.
Rupornis magnirostris insidiatrix	Santa Marta Mts., Colombia.
Herpetotheres cachinnans chapmani	Quintana Roo, Mexico.
Aramides cajanea latens	San Miguel Island, Bay of Panama.
Chaemepelia arthuri	Vicinity of Paramaribo, Surinam.
Pulsatrix perspicillata trinitatis	Island of Trinidad.
Ceophloeus lineatus improcerus	Bahia, Brazil.
Chaetura brachyura praevelox	Chateaubelair, St. Vincent.
Lipaugus simplex frederici	Vicinity of Paramaribo, Surinam.

Placostomus coronatus gumia	Vicinity of Paramaribo, Surinam.
Pitangus lictor panamensis	Loma del Leon, Panama.
Troglodytes musculus paramaribensis	Vicinity of Paramaribo, Surinam.
Stelgidopteryx ruficollis cacabatus	Vicinity of Paramaribo, Surinam.
Ostinops viridis flavescens	Xeberos, Peruvian Amazons.
Tanagra olivacea mellea	Yquitos, Peru.
Sporophila minuta centralis	Near Panama City, Panama.
Saltator olivascens brewsteri	Caparo, Island of Trinidad.
Myospiza humeralis tucumanensis	Tucuman, Argentina.

New genera.

Helicolestes	Type, *Falco hamatus* Illiger.
Hypocnemoides	" *Hypocnemis melanopogon* Sclater.

List of names revived and recognized.

Nyctanassa violacea cayennensis (Gmel.)	Cayenne.
Nyctanassa violacea jamaicensis (Gmel.)	Jamaica.
Aramus scolopaceus carau Vieill.	Paraguay.
Ara severa castaneifrons Lafr.	Bolivia.
Tapera naevia chochi Vieill.	Paraguay.
Streptoceryle torquata cyanea (Vieill.)	Paraguay.
Pteroglossus aracari atricollis (P. L. S. Müll.)	Cayenne (Berl. & Hart.).
Lathria cinerea plumbea Licht.	Upper Amazon.
Colonia leuconota poecilonota Cab.	Br. Guiana.
Empidochanes fuscatus fumosus Berl.	Cayenne.
Turdus fumigatus aquilonalis (Cherrie)	Trinidad.
Nemosia pileata caerulea (Wied.)	Bahia.
Saltator olivascens plumbeus Bonap.	Santa Marta.

Changes in present nomenclature.

Agyrtrina brevirostris brevirostris (Less.) for *A. chionopectus whitelyi* (Boue.).
Agyrtrina brevirostris chionopectus (Gould) for *A. chionopectus chionopectus* (Gould).
Agyrtrina versicolor brabournii nom. nov. for *A. versicolor brevirostris* of authors.

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ANNOTATED LIST OF SPECIES

ARDEIDAE.

1. ARDEA COCOI Linné.

Five specimens, both sexes, adult and immature, Braamspunt, and Vicinity of Paramaribo, February, July, and August.

2. EGRETTA EGRETTA (Gmelin).

Three specimens, Tijgerbank, September.

3. FLORIDA CAERULEA (Linné).

Two specimens, ♂ and ♀, Braamspunt, February, and July.

4. HYDRANASSA TRICOLOR TRICOLOR (P. L. S. Müller).

One ♀, Fort Nieuw Amsterdam, November.

5. DORIPONUS AGAMI (Gmelin).

One specimen, Vicinity of Paramaribo, March.

6. NYCTICORAX NYCTICORAX NAEVIUS (Boddaert).

Seven specimens, adult and immature, Vicinity of Paramaribo, February, May, and December.

The South American bird averages a little smaller than the North American. After measuring much material, however, the difference does not seem to be sufficiently great or sufficiently constant to justify using the name *Nycticorax nycticorax discors* (Nuttall) for the slightly larger North American bird.

7. NYCTANASSA VIOLACEA CAYENNENSIS (Gmelin).

Type-locality.— Cayenne.

Three specimens, one adult and two immature, Braamspunt, July.

The Surinam bird is smaller and darker than the North American *N. v. violacea* (Linné), type-locality Carolina, and it should be recognized as belonging to a distinct race. The adult bird affords the following measurements: — wing, 252; tarsus, 78; exposed culmen, 73.

The West Indian bird should also be recognized as a subspecies. It is about the same size as the North American bird, but much paler in general coloration, with the edges of the feathers of the back especially pale. It should be known as

7a. NYCTANASSA VIOLACEA JAMAICENSIS (Gmelin).

Type-locality.— Jamaica.

8. COCHLEARIUS COCHLEARIUS (Linné).

Three specimens, two adult and one immature, Vicinity of Paramaribo, March, and August.

A single old adult bird from Rio de Janeiro is much larger than the Surinam specimens (wing 293 as against 258, 260, and 270); the bill also is much heavier. If these differences are constant, the larger, southern bird should be known as

8a. COCHLEARIUS COCHLEARIUS CANCROPHAGA (Linné).

Type-locality.— "Brasilia."

9. BUTORIDES STRIATA (Linné).

Nine specimens, Vicinity of Paramaribo, January, February, April, May, June, July, and December.

10. TIGRISOMA LINEATUM (Boddaert).

Eight specimens, Vicinity of Paramaribo, January, February, March, April, May, and September.

11. IXOBRYCHUS ERYTHROMELAS (Vieillot).

Five specimens, Vicinity of Paramaribo, April, June, and July.

12. ZEBRILUS UNDULATUS (Gmelin).

Three specimens, Vicinity of Paramaribo, April, and May.

CICONIIDAE.

13. JABIRU MYCTERIA (Lichtenstein).

One adult, Tijgerbank, September.

IBIDIDAE.

14. HARPIPRION CAYENNENSIS (Gmelin).

Two adults, Vicinity of Paramaribo, May, and September.

15. EUDOCIMUS RUBER (Linné).

Fifteen specimens, Tijgerbank, Motkreek, Pomonakreek, Fort Nieuw Amsterdam, and Herminabank, January, April, May, June, and September.

PLATALEIDAE.

16. AJAIA AJAJA (Linné).

One adult and one immature, Braamspunt, July.

ANATIDAE.

17. CAIRINA MOSCHATA (Linné).

Three adults, ♂♂ and ♀, Vicinity of Paramaribo, February, and March.

18. DENDROCYGNA DISCOLOR Sclater & Salvin.

Eight specimens, Motkreek, and Beneden Suriname, March, and September.

19. POECILONETTA BAHAMENSIS (Linné).

Four specimens, Motkreek, and Beneden Suriname, March, and September.

CATHARTIDAE.

20. CORAGYPS URUBU FOETENS (Wied).

One adult, Paramaribo, April.

21. CATHARTES AURA PERNIGRA (Sharpe).

Two specimens, both males, Paramaribo, and Overtoom, April, and June.

One of these (448 Penard Coll.) bears a label describing the color of the head in life as follows (translated): — "Cere and base of bill, reddish; end of bill, pearl-color or lilac-white; top and back of head, bluish green-yellow; sides of head, neck, and throat, pale bluish green-yellow mixed with orange." This coloration agrees roughly with that of a specimen from Caicara, Venezuela, listed as *Cathartes burrovianus* by Berlepsch and Hartert (Nov. zool., 1902, **9**, p. 111).

F. P. and A. P. Penard (De vogels van Guyana, 1908, **1**, p. 363), under the name *C. burrovianus*, describe the adult birds as having the top and lower part of head, pale violet or sky-blue; sides of head, neck, and throat, a beautiful orange-gray. Immature birds they describe as having the crown and parts above the eyes, whitish; neck, bluish; head, reddish violet with a whitish blue spot on the back of the head. Young in down have lower parts of sides of head and cheeks black; rest of head, brownish. They state further (*loc. cit.*, p. 364) that the orange-color of the throat and sides of head varies very much, and that when the birds fight around a carcass, the color changes to blood-red of almost the same shade as that of the bird they call the Red-headed Vulture.

The same writers, under the name *C. aura* (*loc. cit.*, p. 361), describe the adult birds as having the bare skin of the head and upper neck bright carmine-red, darker at the cere; lora and top of head sometimes whitish. Young birds, they state, have the bare skin of the head and neck more or less blue or blackish. Young in down have a more or less blackish head.

Our specimens are much blacker than specimens from Venezuela, the West Indies, and Mexico, with dark purplish reflections and no brownish edges to the feathers. We have seen four of Cherrie's specimens in the Brooklyn Museum, two of which he calls *C. pernigra* (Sharpe) and two *C. urubitinga* Pelzeln. We cannot see any difference in coloration between these four birds and specimens of *C. aura aura* Linné in the M. C. Z. The Surinam birds, however, are much darker than any of these, and represent a different form.

We are at a loss in regard to the bird with the feathered nape, which Cherrie (Sci. bull. Mus. Brooklyn. inst., 1916, **2**, p. 338) lists under the name *Cathartes urubitinga* Pelzeln, and which he and others regard as a distinct species. In our specimen with the orange and blue head, the feathers of the neck do not extend up to the nape. We have a strong impression that this feathering of the nape is a sign of immaturity. A young bird of *C. a. septentrionalis* Wied in the M. C. Z., from Miami, Florida, shows the feathers of the back of the neck well up to the nape, running diagonally up the sides of the neck, in much the same manner as in Cherrie's two specimens of *C. urubitinga.*

We note also that a large bird from Bahia in the M. C. Z. does not differ from a Falkland Islands specimen with which we have compared it. Hence the southern form, *C. a. jota* (Molina) (= *falklandica* Sharpe) apparently ranges as far north as Bahia on the eastern coast of South America.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Culmen from cere*
448[1]	Overtoom	♂	498	243	60	24
449[1]	Paramaribo	♂	—	241	64	23

[1] Penard Coll.

FALCONIDAE.

22. IBYCTER AMERICANUS (Boddaert).

One adult ♀, "Saramaccapolder, about three hours walk from the Tweede Rijweg," July.

23. MILVAGO CHIMACHIMA CHIMACHIMA (Vieillot).

One immature ♂, Vicinity of Paramaribo, July.

The northern form, ranging from Panama to at least Colombia, differs decidedly from the southern bird, and we name it

23a. MILVAGO CHIMACHIMA CORDATA, subsp. nov.

Type.— M. C. Z. 40,373. Adult ♀. San Miguel Island, Bay of Panama. 27 February, 1904. W. W. Brown, Jr.

Characters.— In general like *M. c. chimachima* (Vieill.), but back much browner, not so blackish; under parts darker, varying from light buff to warm-buff (cartridge-buff in true *M. c. chimachima*); head darker; upper tail-coverts light buff (whitish in true *M. c. chimachima*); base of primaries and under wing-coverts nearly concolor — ochraceous-buff (in true *M. c. chimachima* the base of the primaries is whitish, the under wing-coverts about warm-buff).

Measurements.— *Type*, adult ♀; wing, 292; tail, 196; tarsus, 50; culmen from cere, 22. *Topotype*, M. C. Z. 40,369, adult ♂; wing, 275; tail, 183; tarsus, 50; culmen from cere, 23.

24. GERANOSPIZIAS CAERULESCENS (Vieillot).

Two specimens, ♂ and ♀, Vicinity of Paramaribo, February.

25. ACCIPITER SUPERCILIOSUS (Linné).

One adult, Vicinity of Paramaribo, August.

26. ASTURINA NITIDA NITIDA (Latham).

Three specimens, one adult and two immature, Vicinity of Paramaribo, January, April, and August.

27. RUPORNIS MAGNIROSTRIS MAGNIROSTRIS (Gmelin).

Seven specimens, both sexes, Vicinity of Paramaribo, and Wanaweg, March, April, May, and June.

One skin, (464 Penard Coll.), is so much like *R. m. occidua* Bangs as to be practically indistinguishable. It is noteworthy that this particular bird is the only one collected away from the city, and was taken at Wanaweg. It may be a straggler of *R. m. occidua,* but we do not care to record it as such, since the similarity in coloration may be due to individual variation.

On examining a large series of the various forms of *Rupornis magnirostris,* the eastern Colombian bird stands out clearly, and may be known as

27a. RUPORNIS MAGNIROSTRIS INSIDIATRIX, subsp. nov.

Type.— M. C. Z. E. A. & O. Bangs Coll. 5,014. Adult ♀ Santa Marta Mountains, Colombia. 16 January, 1898. W. W. Brown, Jr.

Characters.— In general like *R. m. magnirostris* (Gmel.), and of about the same size, but paler; upper parts and chest decidedly paler gray; the darker barring on breast and sides paler and less dusky, producing less contrast with the white bars.

28. BUSARELLUS NIGRICOLLIS (Latham).

Six specimens, both sexes, adult and immature, Vicinity of Paramaribo, January, March, April, and June.

These specimens average slightly smaller than Central American birds examined, but we cannot detect any differences in color.

29. BUTEOGALLUS AEQUINOCTIALIS (Gmelin).

One adult ♂ and one immature, Fort Nieuw Amsterdam, and Tijgerbank, April, and September.

30. URUBITINGA URUBITINGA (Gmelin).

One adult ♂, Vicinity of Paramaribo, December.

31. LEUCOPTERNIS ALBICOLLIS (Latham).

One adult ♂, Lelydorp, March.

32. SPIZAETUS TYRANNUS (Wied).

One adult ♂, Vicinity of Paramaribo, March.

33. HERPETOTHERES CACHINNANS CACHINNANS (Linné).

Five specimens, all adult, Vicinity of Paramaribo, February, March, and September.

Chapman (Bull. Amer. mus. nat. hist., 1915, **34**, p. 638) has recently described a small dark form from western Colombia as *H. c. fulvescens.* He had three of the birds listed above for comparison, and describes his new form as darker and smaller, mentioning also that the Mexican bird is larger than true *cachinnans.*

On comparing all our Surinam birds with six from southern Mexico and Yucatan, we find the Mexican form decidedly paler and perhaps a trifle larger.

Measurements.

No.	*Sex*	*Wing*	*Tail*
420[1]	♂	257	190
421[1]	—	275	204
422[1]	—	268	207
440[1]	—	263	198
443[1]	—	260	195

The difference is sufficiently great for separation, and the Mexican form is named: —

33a. HERPETOTHERES CACHINNANS CHAPMANI, subsp. nov.

Type.— M. C. Z. 60,743. Adult ♂. Quintana Roo, Mexico, 22 January, 1912. J. L. Peters.

[1] Penard Coll.

Characters.— In general like *H. c. cachinnans* (Linné), but upper parts paler, browner, and less blackish; under parts varying from soiled white to light buff (warm-buff or even darker in true *H. c. cachinnans*).

Measurements.— *Type*, adult ♂; wing, 270; tail, 204; tarsus, 70; culmen from cere, 22.

34. ROSTRHAMUS SOCIABILIS (Vieillot).

Thirteen specimens, two adult and eleven immature, not sexed, all from Vicinity of Paramaribo, February, March, April, May, and December.

The generic name Rostrhamus Lesson (Traité d'orn., 1830, p. 55), type *Rostrhamus niger* Lesson, judging from the descriptions of both the adult male and young, applies wholly to the bird now known as *Rostrhamus sociabilis* (Vieill.). Lesson refers also to *Falco hamatus* Illiger, Temm., Pl. col., but draws his description from specimens in hand, and not from the plates. Plate 61 represents the adult of the species now known as *R. hamatus*, showing clearly the short tail and short wing-tip, which we consider generically distinct. But Plate 231 depicts the young of *R. sociabilis* with the characteristic long wing-tip and white upper and under tail-coverts.

Hamirostrum Sundevall (Avium disp. tent., 1873, p. 109), is simply a substitute for Rostrhamus Lesson; see A. O. U. Code 1908, Canon XXX, p. lix.

HELICOLESTES, gen. nov.

Type.— *Falco hamatus* Illiger, Temm. Pl. col., 1823, **1**, pl. 61.

Characters.— Similar to Rostrhamus Lesson, but with a very short wing-tip, the primaries exceeding the secondaries by not over 50 mm.; tail very short, about 120 mm.; immature plumage slate-gray, not essentially different from adult, except in white barring of tail and primaries.

35. HELICOLESTES HAMATUS (Illiger).

Seven specimens, adult and immature, not sexed, all from Vicinity of Paramaribo, January, February, March, and December.

This bird, with short tail and short wing-tip, has not been definitely recorded from Surinam up to this time. August Kappler (Holländisch-Guiana, 1881, p. 164) lists *R. hamatus* and *R. leucopygus*, but it is not certain that the specimens were correctly named since *R. sociabilis* does not appear in the same list. Cabanis (Schomburgk's Reisen in Br. Guiana, 1848, **3**, p. 736) records it from British Guiana without description, but omits *R. sociabilis* altogether, hence it is not clear whether he referred to *R. hamatus* or *R. sociabilis*, Chubb (Birds of British Guiana, 1912, **1**) does not include it in his list, and throws Schomburgk's *R. hamatus* into synonymy under *R. sociabilis*. F. P. and A. P. Penard do not include it in their work on the birds of Guiana.

Apparently this species has no brown young plumage. Two specimens, obviously immature, have the general gray coloration of the adult. The tail, however, is crossed by conspicuous, white bars, two in 247[1] and four in 479.[1] The upper and under tail-coverts are narrowly tipped with whitish; the primaries, except tips, are barred; the wing-coverts, secondaries, and some of the feathers on the lower parts, are narrowly tipped with dirty white.

A third specimen, 447,[1] nearly fully adult, has the remains of the bars on the tail and a slight whitish freckling at the base of the first primary. The fully adult bird is almost uniform slate-gray, except the tail, the ends of the primaries, and the tips of the secondaries, which are black.

36. CHONDROHIERAX UNCINATUS (Temminck).

Four specimens, both sexes, adult and immature, Vicinity of Paramaribo, March and May.

One bird, 456[1], is evidently very old, the usual white barring of the lower under-parts being practically obsolete.

37. HARPAGUS BIDENTATUS (Latham).

Three specimens, Vicinity of Paramaribo, and Javaweg, February, April, and July.

38. ICTINIA PLUMBEA (Gmelin).

Three adults, Vicinity of Paramaribo, Wanaweg, and Overtoom, March, and April.

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[1] Penard Coll.

39. FALCO RUFIGULARIS Daudin.

Two specimens, ♂ and ♀, both from Vicinity of Paramaribo, June, and December.

TINAMIDAE

40. TINAMUS MAJOR MAJOR (Gmelin).

One adult ♂, Lelydorp, March.

41. CRYPTURUS MACCONNELLI Brabourne & Chubb.

One adult ♀, Vicinity of Paramaribo, December.

42. CRYPTURUS SOUI SOUI (Hermann).

Two specimens, Vicinity of Paramaribo, April.

CRACIDAE.

43. PENELOPE MARAIL (P. L. S. Müller).

Four specimens, both sexes, Lelydorp, and Javaweg, April, and May.

Berlepsch (Nov. zool., 1908, **15**, p. 297) combines *Penelope jacupeba* Spix and *P. marail* Gmel., using Gmelin's name for the species. But this name is antedated by *Phasianus marail* P. L. S. Müller (Natursystem. Suppl., 1776, p. 125) having the same basis.

44. ORTALIS MOTMOT (Linné).

Four specimens, both sexes, Vicinity of Paramaribo, March, and April.

ODONTOPHORIDAE.

45. ODONTOPHORUS GUIANENSIS GUIANENSIS (Gmelin).

Two specimens, ♂ and ♀, Javaweg, April.

RALLIDAE.

46. ARAMIDES CAJANEA CAJANEA (P. L. S. Müller).

Six specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, February, March, and April.

A fully adult bird, 268,[1] has a uniform, dark, slate-gray crown. In a bird not quite fully adult, 270,[1] the back of the head has a tinge of olive-brown, while a still younger bird, 552,[1] has the entire head brownish with traces of slate-gray.

Some time ago, (Bangs, Amer. nat., 1907, **41**, p. 182) attention was called to a slightly paler and smaller form inhabiting Pearl Islands in the Bay of Panama. On again examining these birds in connection with the new material, we are of the opinion that this form is sufficiently distinct to warrant separation and propose the name

46a. ARAMIDES CAJANEA LATENS, subsp. nov.

Type.— M. C. Z. E. A. & O. Bangs Coll. 14, 297. Adult ♀. San Miguel Island, Bay of Panama. 21 February, 1904. W. W. Brown, Jr.

Characters.— In general like *A. c. cajanea* (P. L. S. Müll.), but slightly smaller and paler throughout; brown of nape and gray of crown and neck paler; brown of breast and sides decidedly paler, more cinnamomeous and less rufous.

Measurements.— *Type,* adult ♀; wing, 163; tail, 58.5; tarsus, 67.5; culmen, 52. For measurements of the other three Pearl Island birds see Bangs *loc. cit.*, p. 181.

47. PORZANA ALBICOLLIS (Vieillot).

Two specimens, ♂ and ♀, Vicinity of Paramaribo, April, and July.

48. PORZANA FLAVIVENTER FLAVIVENTER (Boddaert).

Two specimens, ♂ and ♀, Vicinity of Paramaribo, and Altonaweg, April, and May.

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[1] Penard Coll.

49. Creciscus viridis (P. L. S. Müller).

Four specimens, both sexes, Vicinity of Paramaribo, and Rijsdijkweg, March, April, and July.

50. Ionornis martinicus (Linné).

Seventeen specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Altonaweg, January, April, May, June, and August.

51. Ionornis flavirostris (Gmelin).

Fifteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, April, May, June, and July.

Eurypygidae.

52. Eurypyga helias (Pallas).

Two specimens, both adult males, Vicinity of Paramaribo, May, and December.

Aramidae.

53. Aramus scolopaceus scolopaceus (Gmelin).

Five specimens, both sexes, Vicinity of Paramaribo, February, March, August, and December.

On comparing these with specimens from Paraguay and Uruguay, we find the southern bird to be very much larger, and a little browner and less blackish. The large southern bird should be known as

53a. Aramus scolopaceus carau Vieillot.

Type-locality.— Paraguay.

Measurements.

Aramus scolopaceus scolopaceus (Gmel.).

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Culmen*
602[1]	Vic. Paramaribo	♂	309	118	102
603[1]	" "	♂	298	119	108
604[1]	" "	♀	286	109	91
605[1]	" "	♀	285	103	97

Aramus scolopaceus carau Vieill.

No.	*Locality*	*Sex*	*Wing*	*Tarsus*	*Culmen*
M. C. Z. 72,390	Paraguay	—	321	124	118
" 31,232	Conception del Uruguay	♂	341	128	131
" 31,234	" " "	♂	343	133	124

PARRIDAE.

54. JACANA JACANA (Linné).

Eleven specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, March, April, May, June, and December.

SCOLOPACIDAE.

55. NUMENIUS HUDSONICUS Latham.

One adult ♀, Fort Nieuw Amsterdam, April.

56. TRINGA FLAVIPES (Gmelin).

One specimen, Tijgerbank, September.

57. TRINGA SOLITARIA SOLITARIA Wilson.

Four specimens, three adult and one immature, Vicinity of Paramaribo, February, March, and December.

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[1] Penard Coll.

58. Bartramia longicauda (Bechstein).

One adult ♂, Vicinity of Paramaribo, April.

59. Gallinago braziliensis Swainson.

Sixteen specimens, both sexes, all adult, Vicinity of Paramaribo, February, and March.

Lariidae.

60. Phaetusa chloropoda (Vieillot).

Five specimens, all immature, Braamspunt, July, and September.

61. Sterna superciliaris Vieillot.

Two specimens, both immature, Tijgerbank, September.

62. Rhynchops nigra cinerascens Spix.

One specimen, not quite adult, Tijgerbank, September.

Columbidae.

63. Chloroenas rufina rufina (Temminck & Knip).

Two specimens, ♂ and ♀, Vicinity of Paramaribo, March.

64. Oenoenas plumbea locutrix (Maximilian).

Two adults, ♂ and ♀, Javaweg, April.

65. Chaemepelia passerina griseola (Spix).

Six specimens, both sexes, Vicinity of Paramaribo, May, June, August, and December.

66. CHAEMEPELIA TALPACOTI (Temminck & Knip).

Three specimens, both sexes, Vicinity of Paramaribo, January, March, and December.

This bird is apparently far less common than the following species.

67. CHAEMEPELIA ARTHURI, sp. nov.

Type.— M. C. Z. 80,921 (289 Penard Coll.). Adult ♂. Vicinity of Paramaribo, Surinam, 4 March, 1913. E. Graanoogst.

Six specimens, all adult males except one young female, Vicinity of Paramaribo, January, February, March, and August. Besides these there are two specimens in the M. C. Z. also from the vicinity of Paramaribo, obtained by Francis W. Cragin, U. S. consul in Surinam from 1846 to 1858, and one from Santarem, Brazil, collected by Charles Linden.

Named in honor of Arthur P. Penard, co-author of "De vogels van Guyana," through whose efforts the present collection was formed.

Characters.— Size of *C. talpacoti* (Temm. & Knip) and *C. rufipennis* (Bonap.), differing from the former in having rufous on the inner webs of the primaries — merely a trace on the outermost and gradually increasing in extent, reaching a maximum of intensity in the fourth, fifth, sixth, and seventh (from outside). Tips of all primaries black; in the closed wing the rufous shows as a conspicuous patch on the under side, but the outer aspect of the primaries is black except for a slight rufous edging on the outer vane of the second and third primaries (from outside); under wing-coverts mostly black, but always somewhat mixed with rufous, especially along the carpal edge (in *C. talpacoti* the primaries and under wing-coverts are all black). *C. arthuri* differs from *C. rufipennis* in having the outer edges of the primaries not rufous but black, and in having the under wing-coverts mixed rufous and black instead of rufous.

Measurements.— *Type,* adult ♂; wing, 88; tail, 62.5; tarsus, 15; exposed culmen, 11.5.

Remarks.— This species, in its characters is almost exactly intermediate between *C. talpacoti* and *C. rufipennis;* but we hesitate to rank it as a subspecies, which would necessitate reducing all three forms to subspecific rank, because perfectly typical *C. talpacoti* occurs in the same region with it. The species occupies a very natural faunal area extending from Guiana to the Lower Amazon. The various vague references to *C. rufipennis* in this region probably all apply to *C. arthuri.* The species listed by F. P. and A. P. Penard as *C. rufipennis* is, of course, the bird described above.

68. LEPTOPTILA RUFAXILLA RUFAXILLA (Richard & Bernard).

Ten specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, February, March, April, May, and July.

In two young birds, (426 and 625 Penard Coll.), the outermost primary is not abruptly attenuated as it is in the adult.

69. OREOPELEIA MONTANA (Linné).

Two adults, ♂ and ♀, Vicinity of Paramaribo, and Lelydorp, March, and May.

PSITTACIDAE.

70. ARA ARARAUNA (Linné).

Three adults, ♂ and ♀ ♀, Vicinity of Paramaribo, August.

71. ARA MACAO (Linné).

Two adults, both females, Vicinity of Paramaribo, July.

72. ARA CHLOROPTERA Gray.

One adult ♂, Vicinity of Paramaribo, July.

73. ARA SEVERA SEVERA (Linné).

Four specimens, both sexes, Vicinity of Paramaribo, February, March, and September.

Hellmayr (Abh. K. Bayer. akad. wiss., 1906, p. 578) has substituted Amazon River as the type-locality, and we believe this substitution should stand. We have not seen specimens from the Lower Amazon, but assume that they are the same as those from Guiana. The Surinam bird is considerably smaller than birds from Colombia and Bolivia. Its cheeks are much more naked in appearance because the little cheek-feathers are much thinner, the barbs being more restricted to the base of the shaft. In the Guiana bird the wing-measurement varies from 226 to 233; in Colombian and Bolivian birds from 242 to 250. The larger form which ranges from Bolivia through Colombia to Panama should be known as

73a. ARA SEVERA CASTANEIFRONS Lafresnaye.

Type-locality. Bolivia.

74. DIOPSITTACA HAHNI (Souancé).

Two specimens, one adult ♀ and one young ♂, Altonaweg, May.

75. EUPSITTULA PERTINAX CHRYSOPHRYS (Swainson).

Eight specimens, both sexes, Vicinity of Paramaribo, Rijsdijkweg, and Overtoom, April, May, and September.

Ridgway (Birds of North and Middle America, 1916, **7**, p. 163) considers *E. aeruginosa* (Linné) a subspecies of *E. pertinax* (Linné). Chapman (Bull. Amer. mus. nat. hist., 1917, **36**, p. 257), however, considers *E. aeruginosa* a distinct species, in which case our bird would be called *Eupsittula aeruginosa chrysophrys* (Swainson).

76. PYRRHURA PICTA PICTA (P. L. S. Müller).

Ten specimens, both sexes, Vicinity of Paramaribo, January, March, and July.

77. PSITTACULA PASSERINA PASSERINA (Linné).

Four adults, both sexes, Vicinity of Paramaribo, May, June, and December.

78. BROTOGERYS CHRYSOPTERUS (Linné).

Seven specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, March, April, and August.

79. AMAZONA AMAZONICA AMAZONICA (Linné).

Five specimens, both sexes, Vicinity of Paramaribo, and Pomonakreek, January, March, and May.

In addition to the specimens listed above, we have before us a very large series from British Guiana, Venezuela, Colombia, Upper Amazon, Trinidad, and Tobago, and we recognize at least two races, one from British Guiana *A. a. amazonica,* type-locality Surinam, and *Amazona amazonica tobagensis* Cory (Catalogue of Birds of the Americas, Field mus. nat. hist. Zoöl., 1918, **13**, p. 83) of Tobago.

To this form, which is decidedly paler throughout, more yellowish green, not so olive-green, the difference being particularly noticeable on the shoulders and lesser wing-coverts, we also refer birds from Trinidad.

Cory states that in his Tobago birds four instead of three secondaries are marked with reddish orange. In our series we find birds from Tobago, Trinidad, and the mainland with either three or four secondaries so marked, and we do not consider this character distinctive.

80. PIONUS MENSTRUUS MENSTRUUS (Linné).

Two adult females, Vicinity of Paramaribo, December.

81. PIONUS FUSCUS (P. L. S. Müller).

Five adult females, Vicinity of Paramaribo, and Javaweg, May, and September.

82. DEROPTYUS ACCIPITRINUS (Linné).

Four specimens, all females, "Saramaccapolder, about three hours walk from the Tweede Rijweg," May.

The form described by Hellmayr (Nov. zool., 1905, **12**, p. 303) from Para to eastern Ecuador as *D. a. fuscifrons*, appears to be the immature plumage of *D. accipitrinus* (Linné). At least, we have in this series, besides two adults with hoary heads and coppery patches at the base of the outer tail-feathers, one young bird with dusky forehead with white spots, and without coppery patches on the tail; also another bird, apparently about the same age or a little older, with forehead intermediate between adult and immature, and with slight coppery patches on the tail. Both these young birds have paler under mandibles than the adult.

83. Pionites melanocephala melanocephala (Linné).

Seven specimens, both sexes, Vicinity of Paramaribo, Javaweg, and Rijsdijkweg, February, March, and April.

In skinning one of the birds, 677[1], a fully developed, hard-shelled egg and four others in various stages of development were found. As the egg is, we believe, undescribed we give the measurements: size, 31.5 × 22.5; shape, ovate; the color is, of course, white.

Cuculidae.

84. Coccyzus melacoryphus Vieillot.

One immature ♀, Vicinity of Paramaribo, June.

85. Piaya cayana cayana (Linné).

Six specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Altonaweg, February, April, May, and December.

86. Coccycua rutila rutila (Illiger).

Eight specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Rijsdijkweg.

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[1] Penard Coll.

Two young birds, (824, 825, Penard Coll.) are darker brown and have blackish bills without yellowish under mandible and tip of upper mandible. Iris blackish not red.

87. TAPERA NAEVIA NAEVIA (Linné).

Eleven specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Javaweg, February, March, April, and June.

Birds from Paraguay, Uruguay, and southern Brazil are certainly different from the Guiana bird in being larger, and also browner and paler above. From *T. n. excellens* (Sclater) of Central America both South American forms differ in having much smaller bills.

The larger southern bird should be known as

87a. TAPERA NAEVIA CHOCHI Vieillot.

Type-locality.— Paraguay.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
M. C. Z. 32,066	Conception del Uruguay	♂	110	154	29	15
M. C. Z. 32,067	" " "	♂	114	155	29	15.5
M. C. Z. 23,003	Marajo Island (Near Santarem)	—	111	165	30	16.5
826[1]	Vic. Paramaribo	♂	103	137	28	16
827[1]	" "	♂	104	146	29	17
828[1]	" "	♂	107	156	29.5	16
829[1]	" "	♂	104	147	30	17
830[1]	" "	♀	102	141	30	15.5
831[1]	" "	♀	106	—	28	16
1,359[1]	" "	♀	106	153	30	17

The tail-measurements are not very reliable, on account of the worn condition of some and fresh condition of others.

88. CROTOPHAGA MAJOR Gmelin.

Seven specimens, both sexes, Vicinity of Paramaribo, January, March, April, and December.

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[1] Penard Coll.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tar-sus*	*Exposed culmen*
836[1]	Vic. Paramaribo	♂	196	270	44	46
837[1]	" "	♂	195	253	43	46
838[1]	" "	♂	195	260	42	43
1361[1]	" "	♂	195	255	44	48
1362[1]	" "	♂	199	265	43	48
839[1]	" "	♀	191	240	43	46
1360[1]	" "	♀	184	244	42	43

89. CROTOPHAGA ANI Linné.

Five specimens, both sexes, Vicinity of Paramaribo, and Lelydorp, April, May, and December.

BUBONIDAE.

90. PULSATRIX PERSPICILLATA PERSPICILLATA (Latham).

Six specimens, both sexes, Vicinity of Paramaribo, and Javaweg, January, March, April, and May.

The darker specimens are fully as dark above as *P. p. saturata* Ridgway, but the breast and belly are conspicuously paler buff and never show any cross barring.

Birds from Trinidad are decidedly paler, and we name the island form

90a. PULSATRIX PERSPICILLATA TRINITATIS, subsp. nov.

Type.— M. C. Z. 29,469. Adult. Trinidad. 1880? C. S. Cazabon.

Characters.— In general like *P. p. perspicillata* (Lath.), but upper parts and pectoral collar paler, not so sooty; breast and belly average slightly paler buff.

Measurements.— *Type*, wing, 305; tail, 165; culmen from cere, 28.

Remarks.— In color *P. p. trinitatis* is about intermediate between *P. p. perspicillata* (Lath.) and *P. p. sharpei* Berl., although its range is not geographically between the ranges of these two forms. The above confirms Hellmayr's views (Nov. zool., 1906, **13**, p. 45).

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[1] Penard Coll.

91. Otus choliba crucigerus (Spix).

Six specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, September, and December.

92. Lophostrix cristatus cristatus (Daudin).

One adult, unsexed, Lelydorp, March.

Tytonidae.

93. Tyto alba tuidara (Gray).

Type-locality.— Brazil.

Two adults, ♂ and ♀, both from Vicinity of Paramaribo, January, and March.

Chubb (The birds of British Guiana, 1916, **1**, addenda) gives Griffith & Pidgeon Cuvier's Animal kingdom. Aves, 1829, **1**, p. 75, as authority for *Tyto tuidara* (= *Strix perlata* of authors). On looking up the reference we find that the additional species were inserted by John Edward Gray (*Cf. loc. cit.*, p. 86, footnote). We change the authority accordingly.

Nyctibiidae.

94. Nyctibius griseus griseus (Gmelin).

Four specimens, both sexes, Vicinity of Paramaribo, and Overtoom, April, and August.

Caprimulgidae.

95. Chordeiles acutipennis acutipennis (Boddaert).

One adult ♀, Vicinity of Paramaribo, April.

96. Nyctidromus albicollis albicollis (Gmelin).

Three specimens, ♂♂ and ♀, Vicinity of Paramaribo, and Altonaweg, April, May, and December.

97. Systellura ruficervix (Sclater).

One specimen, ♂, Vicinity of Paramaribo, June.

98. Nyctipolus nigrescens (Cabanis).

One adult ♂, Lelydorp, April.

Alcedinidae.

99. Streptoceryle torquata cyanea (Vieillot).

Type-locality.— Paraguay.

Eleven specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, March, May, August, September, and December.

The Mexican bird, *S. t. torquata* (Linné), in the adult plumage, always has immaculate under tail-coverts; the lining of the wing is also less spotted with dusky. Birds from Paraguay and thence northward to Panama always have some slaty spotting or barring on the under tail-coverts and under wing-coverts, even when fully adult.

On examining a large series of *S. torquata*, we find that the Paraguay and Uruguay forms are more or less intermediate, sometimes approaching closely to *S. t. stellata* (Meyen), showing considerable white spotting and barring on the outer webs of the secondaries, but, on the whole, probably nearer the Guiana form, for which there is a later name — *S. t. caesia* (Reichenbach).

100. Chloroceryle americana americana (Gmelin).

Five specimens, both sexes, Vicinity of Paramaribo, February, March, April, and December.

101. Chloroceryle inda (Linné).

Seven specimens, both sexes, Vicinity of Paramaribo, March, April, May, and December.

102. CHLOROCERYLE AENIA AENIA (Pallas).

Seven specimens, both sexes, Vicinity of Paramaribo, January, February, March, May, and December.

GALBULIDAE.

103. UROGALBA DEA (Linné).

Six specimens, both sexes, Lelydorp, and Javaweg, March, April, May, and June.

104. GALBULA GALBULA (Linné).

Nineteen specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Overtoom, February, March, April, May, and December.

105. GALBULA LEUCOGASTRA Vieillot.

Three specimens, Lelydorp, and Javaweg, March, and May.

106. PSILOPORNIS ALBIROSTRIS ALBIROSTRIS (Latham).

Two adults, ♂ and ♀, Lelydorp, June, and September.

BUCCONIDAE.

107. NOTHARCHUS TECTUS TECTUS (Boddaert).

Three adult males, Vicinity of Paramaribo, March, April, and June.

108. NYSTACTES TAMATIA TAMATIA (Gmelin).

Seven specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, March, April, May, June, and August.

109. MONASA NIGRA (P. L. S. Müller).

Eleven specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, April, and December.

110. CHELIDOPTERA TENEBROSA TENEBROSA (Pallas).

Eleven specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, January, February, March, April, May, June, and September.

RAMPHASTIDAE.

111. RAMPHASTOS MONILIS P. L. S. Müller.

Eight specimens, both sexes, Vicinity of Paramaribo, and Lelydorp, June, July, and August.

112. RAMPHASTOS VITELLINUS Lichtenstein.

Three specimens, ♂♂ and ♀, Vicinity of Paramaribo, and Lelydorp, February, and August.

113. PTEROGLOSSUS ARACARI ATRICOLLIS (P. L. S. Müller).

Six specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, March, May, June, August, and December.

Müller (Natursystem. Suppl., 1776, p. 83) bases his description of *Ramphastos atricollis* on Buffon (ex. Pl. Enl., 166), and gives as type-locality "Brazil." Berlepsch and Hartert (Nov. zool., 1902, **9**, p. 102), considering the type-locality "Brazil" an error, substitute "Cayenne." Daubenton's plate certainly does not picture the Brazilian bird, which has a narrow, black longitudinal band on the ridge of the culmen, but the northern form with the broad, black band. We think that Berlepsch and Hartert were justified in correcting the type-locality. *Pteroglossus aracari roraimae* Brabourne & Chubb (Ann. mag. nat. hist., 1912, **10**, p. 261), type-locality "Mount Roraima," is thus a synonym of *P. a. atricollis* (P. L. S. Müll.).

114. PTEROGLOSSUS VIRIDIS (Linné).

Fifteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, Altonaweg, Javaweg, and Overtoom, January, February, March, April, May, June, and August.

One specimen, 799[1], an abnormally colored bird, has orange-yellow instead of pale yellow under parts becoming decidedly orange where bordering the chestnut throat. Another specimen, 800[1], which shows no other sign of immaturity, has an absolutely smooth bill.

115. SELENIDERA CULIK (Wagler).

Four specimens, one male and three females, Vicinity of Paramaribo, February, May, and June.

CAPITONIDAE.

116. CAPITO NIGER (P. L. S. Müller).

Eight specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, January, March, May, August, and December.

PICIDAE.

117. CHLORONERPES FLAVIGULA (Boddaert).

Six specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, April, May, and September.

118. CHRYSOPTILUS PUNCTIGULA PUNCTIGULA (Boddaert).

Five specimens, four males and one female, Vicinity of Paramaribo, May, and December.

119. TRIPSURUS CRUENTATUS (Boddaert).

One adult ♀, Javaweg, May.

[1] Penard Coll.

120. TRIPSURUS RUBRIFRONS (Spix).

Three specimens, ♂♂ and ♀, Javaweg, May.

121. VENELIORNIS SANGUINEUS (Lichtenstein).

Seven specimens, both sexes, Vicinity of Paramaribo, January, February, April, June, and December.

122. VENELIORNIS CASSINI (Malherbe).

Two specimens, Vicinity of Paramaribo, May, and August.

123. CELEUS ELEGANS HELLMAYRI Berlepsch.

Fourteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, and Overtoom.

This large series from Surinam shows great variation in the color of the head from cinnamon to ochraceous-buff, and in the tone of the brown of both under and upper parts. The yellowish spotting of the back and upper wing-coverts is very conspicuous in some specimens and obsolete in others.

C. B. Cory, who has made a study of the *Celeus elegans* group in connection with his list of South American birds, informs us that the Surinam bird differs decidedly from *C. e. elegans* (P. L. S. Müll.) of Cayenne, and that although it also differs slightly from *C. e. hellmayri*, he would refer the Surinam bird to the latter form.

124. CELEUS UNDATUS (Linné).

One specimen, (♂), Javaweg, May.

125. CROCOMORPHUS FLAVUS FLAVUS (P. L. S. Müller).

Three adults, ♂♂ and ♀, Vicinity of Paramaribo, March, and December.

126. SCAPANEUS RUBRICOLLIS (Boddaert).

Three adult males, Vicinity of Paramaribo, February, May, and September.

127. SCAPANEUS MELANOLEUCOS MELANOLEUCOS (Gmelin).

Five specimens, both sexes, Vicinity of Paramaribo, and Topibo, January, March, April, May, and December.

Cory (Field mus. nat. hist., Pub. 183, Orn., 1915, ser. 1, p. 306) describes a new race, *S. m. cearae* from Ceara, Brazil. On comparing our specimens with others from Bahia, we find the same differences, in that the latter are much smaller. This seems a very distinct form.

128. CEOPHLOEUS LINEATUS LINEATUS (Linné).

Five specimens, both sexes, Vicinity of Paramaribo, January, February, and May.

While there may be several forms in South America, certainly the Bahia bird is different, and we propose for it the name

128a. CEOPHLOEUS LINEATUS IMPROCERUS, subsp. nov.

Type.— M. C. Z. 71,865. Bahia, Brazil (trade skin), adult ♂.

Characters.— In general like *C. l. lineatus* (Linné), but much smaller. The black of the back, wings, and chest more brownish, not so intensely black (this brownish cast may be due to the age of the specimens examined, which are all old Bahia trade skins).

Measurements.

Ceophloeus lineatus improcerus.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
M. C. Z. 71,865 (type)	Bahia	♂	175	120	27	41
" 71,867	"		177	121	26	38
" 71,864	"	♀	180	123	27	38
" 71,866	"	♀	174	117	25	34

Ceophloeus lineatus lineatus.

No.		*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
E. A. & O. Bangs	9,939	Vic. Paramaribo	♂	190	125	30.5	38
"	11,010	" "	♂	195	135	29	39
Penard Coll.	705	" "	♂	202	131	29	33.5
" "	708	" "	♂	205	135	30	39
E. A. & O. Bangs	9,938	" "	♀	188	124	29	38
"	11,011	" "	♀	198	130	30.5	36
Penard Coll.	706	" "	♀	195	142	29	38
" "	707	" "	♀	194	135	29	36
" "	1,357	" "	♀	188	124	30	35

129. Picumnus spilogaster Sundevall.

Ten specimens, both sexes, all from Vicinity of Paramaribo, March, April, May, and December.

130. Picumnus buffoni buffoni Lafresnaye.

Five specimens, both sexes, Vicinity of Paramaribo, and Lelydorp. We have compared our specimens with Lafresnaye's types M. C. Z. 76,026–76,029.

The bird listed by F. P. and A. P. Penard (De vogels van Guyana, 1908, **1**, p. 559) as *Picumnus penardi* Scl., no doubt is identical with this species, so far as we can judge from the description and from the material at hand. The fact that F. P. and A. P. Penard give *P. buffoni* Lafr., with a query, as synonym, seems to strengthen this view. We cannot find any reference to a description of the species by Sclater whom these writers cite as authority, but A. P. Penard informs us that a number of birds were sent to P. L. Sclater for identification, and that among those returned was one bearing on the label the name *Picumnus penardi* Sclater. It is possible that Sclater intended to describe the bird by that name, but that later he found it to be identical with *Picumnus buffoni* Lafr.

Berlepsch (Nov. zool., 1908, **15**, p. 274) considers *P. undulatus* Hargitt of British Guiana a subspecies of *P. buffoni*.

TROGONIDAE.

131. TROGONURUS CURUCUI CURUCUI (Linné).

Two adults, ♂ and ♀, Vicinity of Paramaribo, May.

132. TROGON STRIGILATUS STRIGILATUS (Linné).

Twenty-nine specimens, both sexes, Vicinity of Paramaribo, and Lelydorp, January, February, March, April, May, June, July, August, and December.

133. CHRYSOTROGON VIOLACEUS VIOLACEUS (Gmelin).

Three specimens, ♂♂ and ♀, Vicinity of Paramaribo, May and July.

134. CURUCUJUS MELANURUS MELANURUS (Swainson).

One adult ♂, Rijsdijkweg, April.

MICROPODIDAE.

135. CHAETURA BRACHYURA BRACHYURA Jardine.

Two adults, ♂ and ♀, Vicinity of Paramaribo, March.

We have not seen specimens from Tobago, but Hellmayr (Nov. zool., 1906, **13**, p. 37) who had a large series from Surinam, states that birds from Surinam, Trinidad, and Tobago are absolutely identical.

Five specimens from St. Vincent, in the M. C. Z., certainly represent a different race, for which we propose the name

135a. CHAETURA BRACHYURA PRAEVELOX, subsp. nov.

Type.— M. C. Z. E. A. & O. Bangs Coll. 12,817. Adult ♂. Chateaubelair, St. Vincent, 14 October, 1903. Austin H. Clark.

Characters.— Similar to *C. b. brachyura* Jard., and of same size, but under parts paler, browner, and less blackish; rump and upper tail-coverts distinctly paler, more ashy, the upper tail-coverts in particular much lighter and tipped with whitish; under tail-coverts slightly paler.

In true *C. b. brachyura* the rump and upper tail-coverts are of uniform color, brown and less ashy, and the upper tail-coverts show no whitish borders or tips. Ridgway (Birds of North and Middle America, 1911, **5**, p. 728) gives measurements of St. Vincent birds only, and apparently describes that form, probably not having seen true *C. b. brachyura.*

TROCHILIDAE.

136. THRENETES LEUCURUS LEUCURUS (Linné).

One adult ♂, Vicinity of Paramaribo, February.

137. GLAUCIS HIRSUTA HIRSUTA (Gmelin).

Five specimens, Vicinity of Paramaribo, Lelydorp, and Javaweg, February, March, April, August, and September.

138. PHOETHORNIS SUPERCILIOSUS SUPERCILIOSUS (Linné).

Four specimens, three males and one female, Vicinity of Paramaribo, March.

139. PHOETHORNIS LONGUEMAREUS (Lesson).

Six specimens, both sexes, Vicinity of Paramaribo, January, and February.

140. PHOETHORNIS RUBER RUBER (Linné).

Two specimens, Vicinity of Paramaribo, and Javaweg, March, and April.

141. FLORISUGA MELLIVORA MELLIVORA (Linné).

One adult ♂, Javaweg, May.

142. AGYRTRINA BREVIROSTRIS BREVIROSTRIS (Lesson).

Four specimens, adult and immature, Vicinity of Paramaribo, May. There is apparently some confusion in regard to the nomenclature of this species.

Lesson (Hist. nat. ois.-mouches, 1829, p. 211, pl. 77) originally described this bird as *Ornismya brevirostris*, giving the type-locality "Guiane." Hartert and other authors, however, have used *A. brevirostris* for the Brazilian form, and Brabourne and Chubb (The birds of South America, 1912, **1**, 113), considering the type-locality Guiana an error went so far as to substitute "S. Brazil," excluding Guiana altogether from its range.

On comparing our immature bird, 876,[1] with Lesson's description and plate, we find it to agree perfectly. In the young bird the base of the lower mandible is yellowish, while in the adult the entire bill is black; the lower parts are pure white with some gray in the under tail-coverts; the rump has golden reflections, more pronounced in the adult; and the tail is greenish with darker edges especially in the outer rectrices.

In the Brazilian bird, of which we have a large series, the flanks and sides are more covered with greenish spots, showing much less white on the breast and belly; the rump is practically of the same color as the back; and the tail does not agree so well with Lesson's plate.

It is perfectly obvious that Lesson's description and plate were based on an immature bird of *A. b. brevirostris* differing very decidedly from the Brazilian bird generally known as *A. brevirostris*. Probably the confusion came about from the fact that up to the present time no immature birds of true *A. b. brevirostris* from Guiana have been available for comparison.

We have not seen any specimens of the bird described by Boucard (Humming bird, 1893, **3**, p. 8) as *Uramitra whitelyi*, type-locality Aunai, British Guiana, now considered a subspecies of *A. chionopectus* (Gould), but our adult birds agree exactly with Chubb's illustration (The birds of British Guiana, 1916, **1**, pl. 8), and we provisionally propose to consider it identical with true *A. b. brevirostris*.

F. P. and A. P. Penard (De vogels van Guyana, 1910, **2**, p. 121) list the Surinam birds as *Agyrtria chionopectus* (Gould).

The bird inhabiting Trinidad and the coast of Venezuela, now becomes *Agyrtrina brevirostris chionopectus* (Gould) since the name *brevirostris* antedates *chionopectus*.

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[1] Penard Coll.

This leaves without a name the form called by Simon and Hellmayr (Nov. zool., 1908, 15, p. 1) *Agyrtria versicolor brevirostris* (Lesson), inhabiting eastern Brazil from Bahia to Rio. We propose to name it in honor of Lord Brabourne whose untimely death on the field of battle has interrupted the publication of the great work on South American birds on which he and Mr. Chubb were engaged.

142a. AGYRTRINA VERSICOLOR BRABOURNII, nom. nov.

Type.— U. S. N. M. 45,593. Bahia, Brazil.

Characters.— Differs from *A. v. versicolor* (Vieill.) of southern Brazil in having centre of chin, throat, and chest pure white or only slightly spotted with green.

143. AGYRTRINA LEUCOGASTER LEUCOGASTER (Gmelin).

One adult ♀, Vicinity of Paramaribo, May.

144. AGYRTRINA FIMBRIATA FIMBRIATA (Gmelin).

Twenty-three specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, March, April, May, June, July, August, and September.

145. HYLOCHARIS SAPPHIRINA SAPPHIRINA (Gmelin).

Three specimens, ♂ and ♀ ♀, Vicinity of Paramaribo, May.

In one specimen, (871 Penard Coll.), the bill is almost entirely black, the lower mandible being brownish at the base.

146. HYLOCHARIS CYANUS VIRIDIVENTRIS Berlepsch.

Thirty-four specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, April, and May.

147. CHLORESTES NOTATUS NOTATUS (Reichenbach).

Twenty-two specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Libanonweg, March, April, May, and September.

148. CHLOROSTILBON PRASINUS PRASINUS (Lesson).

Three adults, ♂♂ and ♀, Vicinity of Paramaribo, April, May, and August.

149. ATHRACOTHORAX NIGRICOLLIS NIGRICOLLIS (Vieillot).

Three specimens, ♂♂ and ♀, Vicinity of Paramaribo, May.

Chubb (The birds of British Guiana, 1916, **1**, p. 410) uses the name *A. violicauda* (Bodd.). On looking up his reference (Pl. enl. pl. 671, fig. 2), we find that the bird figured represents the immature plumage of *A. viridigula* (Bodd.) which we have compared with the figure.

150. ANTHRACOTHORAX VIRIDIGULA (Boddaert).

Twelve specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, June, and August.

151. CHRYSOLAMPIS ELATUS (Linné).

Four specimens, both sexes, adult and immature, Vicinity of Paramaribo, April, and May.

152. HELIOTHRIX AURITA AURITA (Gmelin).

One female, Lelydorp, April.

153. LOPHORNIS ORNATUS (Boddaert).

Eight specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Javaweg, April, and May.

DENDROCOLAPTIDAE.

154. GLYPHORHYNCHUS CUNEATUS SIMILLIMUS Hartert & Goodson.

Type-locality.— Ipousin, Approuague River, Cayenne.

Two adults, ♂ and ♀, Rijsdijkweg, and Altonaweg, May, and June.

155. Dendrocincla fuliginosa (Vieillot).

Six specimens, Vicinity of Paramaribo, Lelydorp, and Javaweg, April, May, and September.

156. Xiphorhynchus guttatus sororius (Berlepsch & Hartert).

Ten specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, March, April, May, June, and December.

157. Dendroplex picus picus (Gmelin).

Fourteen specimens, both sexes, all from Vicinity of Paramaribo, January, March, April, and May.

158. Dendrexetastes rufigula (Lesson).

Two specimens, Vicinity of Paramaribo, May.

159. Dendrocolaptes validus plagosus Salvin & Godman.

One adult ♀, Vicinity of Paramaribo, March.

160. Dendrocolaptes certhia (Boddaert).

Three adults, Vicinity of Paramaribo, Lelydorp, and Javaweg, April, and May.

Furnariidae.

161. Synallaxis albescens albigularis Sclater.

One immature ♀, Vicinity of Paramaribo, April.

162. Synallaxis gujanensis gujanensis (Gmelin).

Four females, adult and immature, Vicinity of Paramaribo, March, April, and May.

163. Synallaxis cinnamomea cinnamomea (Gmelin).

Five specimens, both sexes, adult and immature, Vicinity of Paramaribo, May, and December.

164. Synallaxis rutilans rutilans Temminck.

Three specimens, Vicinity of Paramaribo, and Javaweg, May, June, and December.

165. Automolus ochrolaemus turdinus (Pelzeln).

One ♂, Vicinity of Paramaribo, March.

166. Philydor pyrrhodes (Cabanis).

One ♀, Vicinity of Paramaribo, May.

167. Xenops genibarbis genibarbis Illiger.

Two adults, both females, Vicinity of Paramaribo, March.

Formicariidae.

168. Cymbilaimus lineatus lineatus (Leach).

One adult ♂, Lelydorp, March.

169. Taraba major semifasciatus Cabanis.

Six specimens, both sexes, Vicinity of Paramaribo, March, and May.

170. Erionotus punctatus punctatus (Shaw).

Four specimens, Vicinity of Paramaribo, and Lelydorp, March, April, and December.

171. ERIONOTUS MURINUS (Sclater & Salvin).

Two adults, ♂ and ♀, Vicinity of Paramaribo, December.

For the present at least, we refer this species to Erionotus.

172. HYPOLOPHUS CANADENSIS CANADENSIS (Linné).

Fourteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, January, March, April, May, June, and December.

173. THAMNOPHILUS DOLIATUS DOLIATUS (Linné).

Eighteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Lelydorp, January, February, March, April, May, June, July, August, and December.

174. PYGIPTILA STELLARIS (Spix).

Two adults, ♂ and ♀, Vicinity of Paramaribo, and Lelydorp, March, and May.

175. DYSITHAMNUS ARDESIACUS SATURNINUS (Pelzeln).

One adult ♂, Lelydorp, March.

Although the appearance of the bill is different from that of *Dysithamnus guttulatus* (Licht.), the type of the genus, we leave this species for the present in Dysithamnus.

176. THAMNOMANES GLAUCUS Cabanis.

One specimen, Lelydorp, March.

177. MYRMOTHERULA PYGMAEA (Gmelin).

One adult ♀, Vicinity of Paramaribo, May.

178. MYRMOTHERULA SURINAMENSIS SURINAMENSIS (Gmelin).

Eight specimens, both sexes, Vicinity of Paramaribo, January, March, April, and May.

179. MYRMOPAGIS AXILLARIS (Vieillot).

Seven specimens, both sexes, Vicinity of Paramaribo, and Lelydorp, February, March, April, and June.

180. HERPSILOCHMUS STICTURUS STICTURUS Salvin.

One adult ♀, Lelydorp, April.

181. MICRORHOPIAS GRISEA GRISEA (Boddaert).

One adult ♂, Vicinity of Paramaribo, June.

182. CERCOMACRA NIGRESCENS (Cabanis & Heine).

Eighteen specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, February, March, April, May, June, and December.

183. PITHYS ALBIFRONS (Linné).

Seven specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, and Javaweg, February, March, and May.

Immature birds have no white crest or beard. In one specimen, 1,027,[1] the throat is pale gray; in another, 1,026,[1] it is slaty.

184. PERCNOSTOLA RUFIFRONS (Gmelin).

Two adults, ♂ and ♀, Rijsdijkweg, and Altonaweg, April, and May.

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[1] Penard Coll.

185. SCLATERIA NAEVIA (Gmelin).

Three specimens, ♂ and ♀ ♀, Vicinity of Paramaribo, and Lelydorp, March.

186. MYRMODERAS FERRUGINEA (P. L. S. Müller).

One adult ♀, Lelydorp, March.

187. MYRMODERAS ATROTHORAX (Boddaert).

One adult ♂, Rijsdijkweg, April.

188. HYPOCNEMIS CANTATOR (Boddaert).

Four specimens, Vicinity of Paramaribo, and Javaweg, February, May, and June.

HYPOCNEMOIDES, gen. nov.

Type.— *Hypocnemis melanopogon* Sclater, Proc. zool. soc. London, 1857, p. 130.

Characters.— Similar to Myrmoborus Cabanis & Heine, type *Pithys leucophrys* Tschudi, but smaller, bill much longer, more slender, and more flattened, very much like the bill of Sclateria Oberholser.

189. HYPOCNEMOIDES MELANOPOGON (Sclater).

Three males, two adult and one immature, Vicinity of Paramaribo, Lelydorp, and Javaweg, January, March, and April.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
1090[1]	Vic. Paramaribo	♂	63	31	21	18
1091[1]	Lelydorp	♂	65	32	20	18.5

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[1] Penard Coll.

190. MYRMOBORUS LEUCOPHRYS ANGUSTIRUSTRIS (Cabanis).

Seven specimens, both sexes, Vicinity of Paramaribo, February, April, June, and December.

191. FORMICARIUS COLMA COLMA Boddaert.

Two specimens, an adult ♀ and an immature bird, Vicinity of Paramaribo, March.

The bird described by F. P. and A. P. Penard (De vogels van Guyana, 1910, **2**, p. 335) as *F. tamiesoni*, from a skin in possession of Mr. Tamieson in Demerara, is probably the immature plumage of *F. c. colma*. Our young bird agrees exactly with the description.

COTINGIDAE.

192. TITYRA CAYANA (Linné).

Five specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Javaweg, February, March, April, May, and June.

193. PLATYPSARIS MINOR (Lesson).

One ♂, Lelydorp, March.

194. PACHYRHAMPHUS RUFUS (Boddaert).

Four specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Lelydorp, April, May, June, and August.

195. PACHYRHAMPHUS POLYCHROPTERUS NIGER (Spix).

One ♂, Vicinity of Paramaribo, February.

196. LATHRIA CINEREA CINEREA (Vieillot).

Fifteen specimens, both sexes, Vicinity of Paramaribo, Lelydorp, Javaweg, and Rijsdijkweg, February, March, April, May, June, and August.

Berlepsch and Hartert (Nov. zool., 1902, **9**, p. 57) state that "there is no difference between Bahia specimens (*plumbea*) and Guiana birds (*cinerea*)." But in all specimens seen by us, the bird ranging from Bahia to Bolivia is larger and paler colored than the Guiana form. The largest specimen examined is from San Mateo, Bolivia (wing, 130). Wing-measurements of Bahia birds vary from 124 to 127, and of Guiana birds from 116 to 123.

We do not hesitate to recognize two races; a northern, *Lathria cinerea cinerea* Vieill., type-locality, Cayenne, and a southern, *Lathria cinerea plumbea* Licht., type-locality, Bahia.

197. LIPAUGUS SIMPLEX FREDERICI, subsp. nov.

Type.— M. C. Z. 80,922, (921 Penard Coll.). Adult ♂. Vicinity of Paramaribo, Surinam, 6 June, 1913, E. Graanoogst.

Named in honor of Frederik P. Penard, co-author of De vogels van Guyana.

Characters.— Similar to *Lipaugus simplex simplex* (Licht.) of Bahia, but darker throughout, the color of the upper parts and breast much grayer and less olivaceous; wings and tail darker, more blackish and less brownish; belly slightly darker, grayer and less yellowish; tail slightly shorter.

Measurements.— *Type*, adult ♂; wing, 99; tail, 85; tarsus, 22.5; exposed culmen 19.5.

Remarks.— This subspecies has been much discussed, its characters having been pointed out by Berlepsch and Hartert (Nov. zool., 1902, **9**, p. 57) who call it *Lipaugus simplex immundus* Scl. & Salv. Hellmayr (Nov. zool., 1905, **12**, p. 295) states that *L. immundus* of Cayenne is really an entirely different bird, not even belonging in the genus Lipaugus. The range of this form apparently extends from Venezuela and the Orinoco region to the Lower Amazon.

198. ATTILA THAMNOPHILOIDES Spix.

Seven specimens, both sexes, Vicinity of Paramaribo, and Javaweg, April, May, and December.

199. Querula purpurata (P. L. S. Müller).

Eleven specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, Javaweg, and Rijsdijkweg, March, April, May, August, and December.

200. Calvifrons calvus (Gmelin).

Two adults, both males, Vicinity of Paramaribo, February, and March.

201. Gymnoderus foetidus (Linné).

Five specimens, both sexes, adult and immature, Vicinity of Paramaribo, March, and September.

Pipridae.

202. Pipra aureola aureola (Linné).

Seventeen specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, May, and December.

203. Pipra erythrocephala erythrocephala (Linné).

Eight specimens, both sexes, Lelydorp, Wanaweg, Javaweg, and Rijsdijkweg, March, April, and May.

204. Pipra leucocilla leucocilla Linné.

Six specimens, both sexes, Lelydorp, Libanonweg, and Rijsdijkweg, April, June, and November.

205. Piprites chlorion (Cabanis).

One ♂, Lelydorp, March.

206. XENOPIPO ATRONITENS Cabanis.

One ♂, Lelydorp, April.

207. CHIROPRION PAREOLA PAREOLA (Linné).

Eleven specimens, all males, one immature, Vicinity of Paramaribo, February, March, and May.

208. MANACUS MANACUS MANACUS (Linné).

Seven specimens, both sexes, Vicinity of Paramaribo, Lelydorp, and Rijsdijkweg, March, April, and September.

209. SCOTOTHORUS AMAZONUM WALLACII (Sclater & Salvin).

Two adult males, both from Vicinity of Paramaribo, December.

210. NEOPELMA CHRYSOCEPHALUM (Pelzeln).

Three specimens, ♂♂ and ♀, Lelydorp, April.
One immature bird, (940 Penard Coll.), has a yellow crest and the adults, (938 and 939 Penard Coll.), an orange one.

211. LANIOCERA HYPOPYRRHA (Vieillot).

Three specimens, ♂ and ♀♀, Vicinity of Paramaribo, Lelydorp, and Javaweg, March, and May.

TYRANNIDAE.

212. FLUVICOLA PICA (Boddaert).

Three males, Vicinity of Paramaribo, January, June, and December.

213. ARUNDINICOLA LEUCOCEPHALA (Linné).

Four specimens, all adult males, Vicinity of Paramaribo, March, April, May, and August.

214. COLONIA LEUCONOTA POECILONOTA (Cabanis).

Type-locality.— Canuku Mountains, British Guiana.

Two adults, ♂ and ♀, Javaweg, April.

The Guiana bird is certainly a strongly marked subspecies.

Lafresnaye's three cotypes were probably from Bogota. The original labels, in his own handwriting, read "Copurus leuconotus nob. (Colombie)." The specimens agree perfectly with numerous birds from Colombia, Panama, and Costa Rica, in the M. C. Z., and differ conspicuously from the Surinam specimens.

The Guiana bird is much larger throughout, with a heavier bill. The pileum is clearer gray, less sooty, and the general coloration is much blacker and less brownish, with very little grayish on the middle of the belly.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
962[1]	Javaweg, Surinam	♂ (?)	78	56.5	15.5	10
963[1]	" "	♀ (?)	85	56	15	9.5

The tail is measured to the end of the normal rectrices, disregarding the long central pair which vary too much.

215. PLACOSTOMUS CORONATUS GUMIA, subsp. nov.

Type.— M. C. Z. 80,961 (964[1]). Adult ♂. Vicinity of Paramaribo, Surinam, 20 March, 1914. E. Graanoogst.

Characters.— Similar to *P. c. superciliaris* (Lawrence) and of same size, but appearance of head different; the black margins of the crown-patch very narrow and obscure over the eyes; the russet sides of the crown-patch extending to the black margins without any dull olive-brown edge, and to the base of the culmen without any dull olive-brown frontal band; lower parts slightly paler and clearer yellow, less olive-yellow. Differs from *P. c. coronatus* (Sclater) in lacking the brownish chest and sides, and in having yellowish instead of dull cream-buff underparts.

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[1] Penard Coll.

Measurements.— *Type*, adult (♂); wing, 56; tail, 25.5; tarsus, 12; exposed culmen, 11.5.

Remarks.— The single specimen does not agree with any skin in a very large series from Costa Rica and Panama. Apparently no other specimens have been taken in this locality, except those listed by Sclater (Cat. birds Brit. mus., 1888, **14**, p. 68) and by F. P. and A. P. Penard (De vogels van Guyana, 1910, **2**, p. 211).

216. Rhynchocyclus sulphurescens cherriei Hartert & Goodson.

Two adults, ♂ and ♀, Vicinity of Paramaribo, and Lelydorp, March.

217. Rhynchocyclus poliocephalus sclateri Hellmayr.

Four specimens, both sexes, Vicinity of Paramaribo, May, and December.

218. Ramphotrigon ruficauda (Spix).

Three specimens, Lelydorp, and Rijsdijkweg, April.

219. Todirostrum cinereum cinereum Linné.

Nine specimens, both sexes, Vicinity of Paramaribo, January, February, March, April, June, July, and September.

One specimen, 226,[1] has a number of yellowish white spots on the head. Another, 968,[1] shows very faint traces of the same.

220. Todirostrum pictum Salvin.

Two adults, ♂ and ♀, Vicinity of Paramaribo, May, and June.

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[1] Penard Coll.

221. Todirostrum maculatum maculatum Desmarest.

Four specimens, both sexes, Vicinity of Paramaribo, February, June, and August.

We think that the bird described by F. P. and A. P. Penard (De vogels van Guyana, 1910, 2, p. 214) as *T. surinamense* is identical with this species.

222. Colopteryx galeatus (Boddaert).

Five specimens, both sexes, Vicinity of Paramaribo, January, February, and March.

223. Pipromorpha oleaginea oleaginea (Lichtenstein).

Three specimens, Vicinity of Paramaribo, and Lelydorp, January, and April.

224. Phaeomyias murina incomta (Cabanis & Heine).

Thirteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, January, February, April, May, August, and December.

225. Camptostoma pusillum napaeum (Ridgway).

Four adults, ♂♂ and ♀♀, Vicinity of Paramaribo, February, April, July, and August.

226. Tyrannulus elatus elatus (Latham).

Nine specimens, both sexes, Vicinity of Paramaribo, April, May, June, and December.

227. Tyranniscus gracilipes Sclater & Salvin.

Two specimens, Vicinity of Paramaribo, April, and June.

228. Elaenia martinica flavogaster (Thunberg).

Thirteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, Javaweg, and Rijsdijkweg, January, March, April, May, June, July, August, and September.

229. Myiopagis gaimardii guianensis Berlepsch.

Two adults, ♂ and ♀, Vicinity of Paramaribo, and Lelydorp, March.

See Cherrie's remarks on this genus and on the genus Elainopsis (Sci. bull. Mus. Brooklyn inst., **2**, 1916, p. 230).

230. Myiopagis flavivertex (Sclater).

Three specimens, ♂ and ♀ ♀, Vicinity of Paramaribo, January, February, and May.

231. Legatus albicollis albicollis (Vieillot).

Six specimens, both sexes, Vicinity of Paramaribo, February, March, and September.

232. Sublegatus fasciatus (Thunberg).

One specimen, unsexed, Vicinity of Paramaribo, May.

233. Myiozetetes cayennensis cayennensis (Linné).

Seven specimens, adult and immature, Vicinity of Paramaribo, and Lelydorp.

234. Pitangus sulphuratus sulphuratus (Linné).

Eight specimens, both sexes, adult and immature, Vicinity of Paramaribo, March, April, May, June, July, and December.

235. PITANGUS LICTOR LICTOR (Lichtenstein).

Three specimens, adult and immature, Vicinity of Paramaribo, February, March, and May.

Ridgway (Birds of North and Middle America, 1907, **4**, p. 675) calls attention to two specimens from Brazil which are larger than the Panama birds. Of our three Surinam specimens one is a nestling and one other has the primaries in moult; hence these two are not reliable for measurements. The third specimen is nearly as large as the two Brazilian specimens which Ridgway had and now before us. Our Surinam bird (986 Penard Coll.), offers the following measurements: adult ♂, wing 92; tail, 69; tarsus, 19; exposed culmen, 22.

We think the small northern form should be recognized as a distinct race, and name it

235a. PITANGUS LICTOR PANAMENSIS, subsp. nov.

Type.— M. C. Z. E. A. & O. Bangs Coll. 7,214. Adult ♂. Loma del Leon, Panama, 7 March, 1900. W. W. Brown, Jr.

Characters.— Similar to *P. l. lictor* (Licht.), but decidedly smaller.

Measurements.— *Type,* adult ♂; wing, 87; tail, 69; tarsus, 18; exposed culmen, 20. See Ridgway (*loc. cit.,* p. 675) for further measurements.

236. MYIODYNASTES MACULATUM MACULATUM (P. L. S. Müller).

One female, Vicinity of Paramaribo, February.

237. MEGARHYNCHUS PITANGUA PITANGUA (Linné).

Two adults, ♂ and ♀, Vicinity of Paramaribo, March, and June.

238. MYIOBIUS BARBATUS BARBATUS (Gmelin).

Two specimens, both from Javaweg, May, and June.

239. EMPIDOCHANES FUSCATUS FUMOSUS Berlepsch.

Type locality.— Cayenne.

Four specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, and April.

The bird described as *E. surinamensis* by F. P. and A. P. Penard (De vogels van Guyana, 1910, **2**, p. 258) is without doubt the same as that described as *E. fuscatus fumosus* by Berlepsch (Nov. zool. 1908, **15**, p. 129).

Our specimens agree perfectly with Berlepsch's description of the Cayenne bird. The form is not included in Brabourne and Chubb's list; neither does Cayenne or Surinam appear in the geographical distribution of any form recognized by them; but so far as we can judge from the material we have examined it is an excellent race.

240. MYARCHUS TUBERCULIFER TUBERCULIFER (d'Orbigny & Lafresnaye).

One ♀, Lelydorp, April.

241. TYRANNUS MELANCHOLICUS SATRAPA (Cabanis & Heine).

Six specimens, both sexes, Vicinity of Paramaribo, January, March, May, and August.

242. MUSCIVORA TYRANNUS (Linné).

Thirteen specimens, both sexes, Vicinity of Paramaribo, May, June, and August.

MIMIDAE.

243. MIMUS GILVUS GILVUS (Vieillot).

Three specimens, Vicinity of Paramaribo, March, April, and May.

Ridgway (Birds of North and Middle America, 1907, **4**, p. 235) states that he only had one Guiana specimen for comparison, and that he was not sure that the West Indian birds of this species were really referable to the typical form. He thinks that they may have been introduced into the French islands from Guiana, since a recognizably distinct form (*M. g. tobagensis*) is to be found on the intermediate island of Tobago. He states also that the Guiana specimen examined by him had a much smaller bill than any, that it was less in some other measurements, and that the middle and greater wing-coverts were more distinctly tipped with white.

On examining the specimens before us we cannot find that the smaller bill or smaller size of the Guiana bird holds; nor does there seem to be any constant difference in the white tips of the wing-coverts. We believe that the West Indian form is identical with that of Guiana, and that it was probably introduced from there as Ridgway suggests.

244. DONACOBIUS ATRICAPILLUS ATRICAPILLUS (Linné).

Eleven specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, April, May, June, and December.

Immature birds have a more or less distinct supra-auricular stripe similar to that of the immature of *D. a. albovittatus* d'Orb. of Bolivia, but not nearly so broad or conspicuous. In the adult bird this stripe is entirely missing.

TURDIDAE.

245. TURDUS GYMNOPHTHALMUS GYMNOPHTHALMUS (Cabanis).

Eight specimens, both sexes, Vicinity of Paramaribo, February, March, April, and August.

246. TURDUS FUMIGATUS FUMIGATUS (Lichtenstein).

Three males, Vicinity of Paramaribo, February, and May.

Specimens from Trinidad with which we have compared our Surinam birds, are much paler and brighter, the upper parts are more ochraceous-tawny, less cinnamon-brown; the under parts are almost clay-color, not tawny-olive or even darker.

Cherrie (Sci. bull. Mus. Brooklyn Inst., 1909, **1**, p. 387) separated the Trinidad form as *Planesticus fumigatus aquilonalis*. We think this form is perfectly good, although it is not included by Brabourne and Chubb in their list of South American birds.

247. TURDUS ALBIVENTER ALBIVENTER (Spix).

Four specimens, both sexes, adult and immature, Vicinity of Paramaribo, March, April, and May.

TROGLODYTIDAE.

248. THRYOPHILUS ALBIPECTUS ALBIPECTUS (Cabanis).

Seven specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, March, April, May, and December.

One immature bird, (1,340 Penard Coll.), is much paler above than the adults, and has more white below than the others, answering perfectly to the description of *T. a. hypoleucus* Berlepsch & Hartert from the middle course of the Orinoco (Nov. zool., 1902, **9**, p. 6).

249. THRYOTHORUS CORAYA CORAYA (Gmelin).

Eight specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, Javaweg, and Rijsdijkweg, February, March, April, and May.

250. TROGLODYTES MUSCULUS PARAMARIBENSIS, subsp. nov.

Type.— M. C. Z. 80,923, (1,336 Penard Coll.). Adult ♂. Vicinity of Paramaribo, Surinam, 20 May, 1912. E. Graanoogst.

Three specimens, both sexes, Vicinity of Paramaribo, March and May.

Characters.— Similar to *T. m. musculus* Naum. and *T. m. clarus* Berl. & Hart., differing from the former in being much paler and whiter below, and from the latter in being much darker above; differing from both in having the back more conspicuously and more heavily barred with dusky. This form is not intermediate between *T. m. musculus* and *T. m. clarus,* because the upper parts are even darker than in *T. m. musculus,* and the lower parts are paler than in *T. m. clarus.*

Measurements.— *Type,* adult ♂; wing, 54.5; tail, 40.5; tarsus, 18; exposed culmen, 13.

Remarks.— The type-locality of *T. m. clarus* Berl. & Hart. is Bartica Grove, British Guiana, and not Altagracia, Venezuela, as stated by Oberholser (Proc. U. S. N. M., 1904, **27**, p. 206). The range of *T. m. clarus*, according to Hellmayr (Nov. zool., 1905, **12**, p. 270; 1906, **13**, p. 6), extends from Trinidad and the Orinoco region, through Cayenne, to Para. Berlepsch (Nov. zool., 1908, **15**, p. 107) records ten specimens from Cayenne, which he calls *T. m. clarus*. If the Cayenne and Para specimens have been carefully compared with type-specimens, and are really the same, then our bird must be an extremely local form inhabiting the low coastal region of Surinam. In all events, we find it impossible to reconcile our specimens to either of the two forms with which we have compared them.

POLIOPTILIDAE.

251. POLIOPTILA LIVIDA LIVIDA (Gmelin).

Four specimens, both sexes, Vicinity of Paramaribo, April, and May.

CORVIDAE.

252. CYANOCORAX CAYANUS (Linné).

Four specimens, ♂♂ and ♀♀, all from Lelydorp, March, and April.

VIREONIDAE.

253. PACHYSYLVIA PECTORALIS (Sclater).

Ten specimens, both sexes, Vicinity of Paramaribo, January, February, April, May, June, and December.

HIRUNDINIDAE.

254. PROGNE CHALYBEA CHALYBEA (Gmelin).

Three specimens, ♂♂ and ♀, Vicinity of Paramaribo, September.

255. Stelgidopteryx ruficollis cacabatus, subsp. nov.

Type.— M. C. Z. 80,924 (1,348 Penard Coll.). Adult ♂. Vicinity of Paramaribo, Surinam, 19 June, 1913. E. Graanoogst.

Seven specimens, both sexes, all from Vicinity of Paramaribo, April, May, and June.

Characters.— Similar to *S. r. ruficollis* (Vieillot) but the whole upper parts including wings and tail much darker, more blackish, less brownish; size, slightly smaller. Differs from *S. r. uropygialis* (Lawr.) in having the rump not conspicuously paler than the back, but the upper parts of about the same color.

Measurements.

No.	*Locality*	*Sex*	*Wing*	*Tail*	*Tarsus*	*Exposed culmen*
M. C. Z. 80,924 (type)	Vic. Paramaribo	(♂)	114	54	11	9
Penard Coll. 1,294	“ “	(♂)	116.5	55.5	10	8
“ “ 1,296	“ “	(♂)	109	53	11	7.5
“ “ 1,297	“ “	(♂)	111	54.5	10	8
“ “ 1,356	“ “	(♂)	104	53	10	6.5
“ “ 1,295	“ “	(♀)	102	51	9.5	8
“ “ 1,358	“ “	(♀)	108	51.5	11	7

Remarks.— Ridgway (Birds of North and Middle America, 1904, **3**, p. 58, 64) has already called attention to the difference between the Guiana and Colombian birds. Hellmayr (Nov. zool., 1906, **13**, p. 13) gives a brief review of the South American forms of *S. ruficollis*, but appears to have had no birds from Surinam. Brabourne & Chubb (The birds of South America, 1912, **1**, p. 328) do not include Surinam in the geographical distribution of any form of *S. ruficollis.* Berlepsch (Nov. zool., 1908, **15**, p. 110) lists *S. ruficollis* (Vieill.) from Cayenne, but he had no specimens and refers only to Cayenne skins of the Sclater collection in the British Museum. F. P. and A. P. Penard (De vogels van Guyana, 1910, **2**, p. 506) refer the Surinam bird to *S. r. aequalis* Bangs, which it certainly is not, the latter ranging only as far south as British Guiana.

Mniotiltidae.

256. Dendroeca aestiva aestiva (Gmelin).

Three specimens, Vicinity of Paramaribo, January, and December.

Coeribidae.

257. Coereba chloropyga guianensis (Cabanis).

Four specimens, both sexes, Vicinity of Paramaribo, May, June, and August.

258. Dacnis cayana cayana (Linné).

Thirteen specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Rijsdijkweg, January, February, March, April, and May.

259. Dacnis lineata (Gmelin).

Type-locality.— Cayenne.

One adult ♂, Javaweg, April.

We use Gmelin's name instead of *Dacnis angelica* Bonaparte, because the description (Syst. nat., 1789, **1**, p. 990), although imperfect, undoubtedly applies to this species, as supported by the reference to Buffon (Hist. nat. ois., **5**, p. 342). See also Berlepsch (Nov. zool., 1908, **15**, p. 111).

260. Cyanerpes cyaneus cyaneus (Linné).

One adult ♂, Rijsdijkweg, April.

261. Cyanerpes caeruleus caeruleus (Linné).

Seven specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, Javaweg, and Rijsdijkweg, April, May, July, and September.

262. Chlorophanes spiza spiza (Linné).

Three specimens, ♂ and ♀ ♀, Lelydorp, and Rijsdijkweg, March, and April.

One female, (1,283 Penard Coll.), has the bill entirely black instead of having the lower mandible yellow at the base.

ICTERIDAE.

263. OSTINOPS DECUMANUS DECUMANUS (Pallas).

Six specimens, both sexes, Vicinity of Paramaribo, March, April, and December.

264. OSTINOPS VIRIDIS VIRIDIS (P. L. S. Müller).

One adult ♂, Javaweg, April.

Birds from Venezuela, British Guiana, and Surinam, are darker than those from the Upper Amazon. The darkest specimens are from Guiana. We propose to separate the Upper Amazonian form as

264a. OSTINOPS VIRIDIS FLAVESCENS, subsp. nov.

Type.— M. C. Z. 34,744. Adult ♂. Xeberos, Peruvian Amazons, 16 June, 1866. Bartlett Coll. British Museum. Received in exchange.

Characters.— Similar to *O. v. viridis* (P. L. S. Müll.), and of about the same size, but the green parts much brighter and yellower, the feathers with less grayish olive in the center.

Measurements.— *Type,* adult ♂; wing, 231; tail, 162; tarsus, 56; culmen, 66.5.

265. CACICUS CELA (Linné).

Nine specimens, both sexes, adult and immature, Vicinity of Paramaribo, February, March, May, and December.

266. CACICUS HAEMORRHOUS HAEMORRHOUS (Linné).

Seventeen specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Javaweg, February, March, April, and May.

267. CASSIDIX ORYZIVORA ORYZIVORA (Gmelin).

Three adults, ♂♂ and ♀, Vicinity of Paramaribo, and Javaweg, January, and April.

268. DOLYCHONIX ORYZIVORUS (Linné).

One adult ♂, Vicinity of Paramaribo, April.

269. MOLOTHRUS BONARIENSIS ATRONITENS Cabanis.

Seven specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, January, February, March, and April.

270. XANTHOSOMUS ICTEROCEPHALUS ITEROCEPHALUS (Linné).

Twenty-one specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, and Javaweg, March, April, May, and June.

271. LEISTES MILITARIS MILITARIS (Linné).

Twenty-eight specimens, both sexes, adult and immature, all from Vicinity of Paramaribo, March, April, May, June, August, and December.

272. ICTERUS CHRYSOCEPHALUS (Linné).

Two adult males, Vicinity of Paramaribo, April, and July.

TANAGRIDAE.

273. TANAGRA FINSCHI (Sclater & Salvin).

One adult ♂, Vicinity of Paramaribo, December.

274. TANAGRA OLIVACEA OLIVACEA (Desmarest).

Four specimens, both sexes, Vicinity of Paramaribo, August, and September.

Hellmayr (Nov. zool., 1907, **4**, p. 43) states that he can see no difference between skins from Cayenne and Upper Amazonia. Berlepsch (Intern. ornith. kongress, Berlin, 1910) gives the range of

Euphonia olivacea Desm. from Colombia to Cayenne, and from central and western Brazil to northeastern Peru and Bolivia.

We have compared a series of males from Surinam with two adult males, one from the Upper Amazon (probably Rio Negro), collected by Newton Dexter on the Nathaniel Thayer Expedition, and one from Yquitos, Peru. The difference in coloration is sufficiently great to warrant separation of the Upper Amazonian form as

274a. TANAGRA OLIVACEA MELLEA subsp. nov.

Type.— M. C. Z. E. A. & O. Bangs Coll. 23,020. Adult ♂. Yquitos, Peru. Dr. Hahnel. Count von Berlepsch in exchange.

Characters.— Similar to *T. o. olivacea* (Desm.), and of the same size, but back much more purplish and less greenish, the purple of the head not so sharply contrasting with the color of the rest of the upper parts. The difference is somewhat similar, although not so marked, to that shown by *Tanagra violacea violacea* (Linné) and *Tanagra violacea magna* (Berl.).

Measurements.— *Type*, adult ♂; wing, 50; tail, 25.5; tarsus, 12; exposed culmen, 7.5.

275. TANAGRA VIOLACEA VIOLACEA (Linné).

Four specimens, both sexes, Vicinity of Paramaribo, February, July, and December.

276. TANAGRELLA VELIA VELIA (Linné).

One adult ♂, Lelydorp, March.

277. TANGARA MEXICANA MEXICANA (Linné).

Eleven specimens, both sexes, Vicinity of Paramaribo, and Javaweg, February, March, April, May, and June.

278. THRAUPIS EPISCOPUS EPISCOPUS (Linné).

Eleven specimens, both sexes, Vicinity of Paramaribo, January, February, March, April, May, June, and July.

279. Thraupis palmarum melanoptera (Sclater).

Six specimens, both sexes, Vicinity of Paramaribo, and Lelydorp, February, April, and June.

280. Ramphocelus carbo carbo (Pallas).

Twenty-seven specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, and Javaweg, January, March, April, May, June, July, August, and December.

281. Lanio atricapillus (Gmelin).

Two adults, ♂ and ♀, Lelydorp, March.

282. Tachyphonus rufus (Boddaert).

Twelve specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Lelydorp, January, April, May, June, and August.

283. Tachyphonus surinamus surinamus (Linné).

One adult ♂, Lelydorp, March.

284. Tachyphonus intercedens Berlepsch.

Four specimens, both sexes, Vicinity of Paramaribo, and Altonaweg, May, and August.

285. Nemosia pileata pileata (Boddaert).

Six adults, both sexes, Vicinity of Paramaribo, March, and May.

Bahia birds, with which we have compared our specimens, average slightly paler and grayer blue on the upper parts. They also have more whitish edgings on the outer webs of the greater wing-coverts, and much more extended white loral patches. The difference is enough to establish the Bahia form as

285a. NEMOSIA PILEATA COERULEA (Wied).

Type-locality.— Bahia.

286. HEMITHRAUPIS GUIRA NIGRIGULA (Boddaert).

Four specimens, both sexes, Vicinity of Paramaribo, February and April.

FRINGILLIDAE.

287. CYANOCOMPSA CYANOIDES ROTHSCHILDII (Bartlett).

One immature ♂, Javaweg, May.

288. ORYZOBORUS ANGOLENSIS BREVIROSTRIS Berlepsch.

Four adult males, Vicinity of Paramaribo, and Rijsdijkweg, April, and December.

289. ORYZOBORUS CRASSIROSTRIS CRASSIROSTRIS (Gmelin).

Five specimens, both sexes, Vicinity of Paramaribo, April, and May.

290. SPOROPHILA CASTANEIVENTRIS Cabanis.

Three specimens, ♂ and ♀ ♀, Vicinity of Paramaribo, May, and July.

291. SPOROPHILA MINUTA MINUTA (Linné).

Seven specimens, both sexes, adult and immature, Vicinity of Paramaribo, and Lelydorp, January, February, May, and August.

On comparing these, which are practically topotypes, with a very large series from Panama and Costa Rica, we note a striking difference, and propose to separate the northern form as

291a. SPOROPHILA MINUTA CENTRALIS, subsp. nov.

Type.— M. C. Z. 40,784. Adult ♂. Panama, near Panama City, 19 May, 1904. W. W. Brown, Jr.

Characters.— In adult male plumage similar to *S. m. minuta* (Linné), but averaging slightly smaller; the upper parts browner gray, not so pure and clear gray; the underparts and rump much lighter rufous cinnamon to cinnamon rufous. (In all the Surinam birds the under parts and rump are very deep cinnamon rufous, the difference being apparent even in some very old Cayenne trade skins).

Measurements.— *Type,* adult ♂; wing, 49; tail 35.5; tarsus, 13.5; exposed culmen, 7.5.

Remarks.— We would refer the Colombian bird to this northern form. For further measurements see Ridgway, (Birds of North and Middle America, 1901, **1**, p. 567).

292. SPOROPHILA AMERICANA (Gmelin).

Twelve specimens, both sexes, adult and immature, Vicinity of Paramaribo, January, March, April, May, June, July, August, and September.

293. SPOROPHILA LINEOLA (Linné).

Nine specimens, both sexes, adult and immature, Vicinity of Paramaribo, May, June, August, and September.

294. VOLATINIA JACARINI SPLENDENS (Vieillot).

Six specimens, both sexes, adult and immature, Vicinity of Paramaribo, Lelydorp, and Rijsdijkweg, April, May, August, and December.

295. PITYLUS GROSSUS (Linné).

One adult ♀, Altonaweg, May.

296. SALTATOR MAXIMUS (P. L. S. Müller).

Three specimens, adult and immature, Vicinity of Paramaribo, and Lelydorp, April, and December.

297. SALTATOR OLIVASCENS OLIVASCENS Cabanis.

Eleven specimens, both sexes, adult and immature, also one nestling, Vicinity of Paramaribo, and Lelydorp, January, February, March, April, June, July, and August.

In addition to the above, we have before us a large series of this species from British Guiana, Venezuela, Colombia, and Trinidad, and we distinguish three races:

297a. SALTATOR OLIVASCENS OLIVASCENS Cabanis.

Type-locality.— British Guiana. A dark-colored bird ranging from Surinam to Venezuela; the Venezuelan specimens tending a little toward the next form.

297b. SALTATOR OLIVASCENS PLUMBEUS Bonaparte.

Type-locality.— Santa Marta, Colombia. A decidedly paler bird, the upper parts much lighter gray.

297c. SALTATOR OLIVASCENS BREWSTERI, subsp. nov.

Type.— William Brewster Coll. 30,845. Adult ♂. Caparo, Trinidad, 22 March, 1894. William Brewster.

Characters.— In general coloration intermediate between the two forms above, but differing from both in having a very much wider and more distinctly white superciliary stripe which reaches quite to the base of the culmen and is widest at that point.

Measurements.— *Type*, adult ♂; wing, 104; tail, 94; tarsus, 27; exposed culmen, 20.5.

Remarks.— Venezuelan birds are intermediate in coloration between *S. o. olivascens* and *S. o. plumbeus.* Some specimens from the Lower Orinoco delta have a broad superciliary stripe extending nearly to the culmen, but in none seen by us is it so much developed as in the Trinidad specimens.

298. MYOSPIZA HUMERALIS HUMERALIS (Bosc.).

Type-locality.— Cayenne.

One adult ♂, Vicinity of Paramaribo, March.

Our single specimen is a fully adult male, and we assume that it is the same as the Cayenne bird, which we have not seen. So far as the evidence of one specimen shows, it is certainly different from the form inhabiting eastern Brazil and Uruguay, which is *Myospiza humeralis manimbe* (Lichtenstein), type-locality, Bahia.

Our bird differs conspicuously from *M. h. manimbe* in having the belly and throat almost pure white, and the pectoral band, sides of the neck, and flanks gray instead of brownish. The black central markings of the feathers of the back are much narrower than in *M. h. manimbe,* more nearly as in *M. h. columbianus* Chapman.

Still another recognizable form is a bird from Tucuman, Argentine Republic, which we name

298a. MYOSPIZA HUMERALIS TUCUMANENSIS, subsp. nov.

Type.— M. C. Z. 80,925. Adult ♂. Tucuman, Argentina, 18 December, 1901.

Characters.— A pale form; the dark central markings of the feathers of the upper parts very narrow, the edges of the feathers very pale and grayish, with very little brown; the whole under parts almost uniform buffy white, entirely lacking the darker pectoral band; sides and flanks but little darker than the belly.

Measurements.— *Type,* adult ♂; wing, 61; tail, 50; tarsus, 20.5.

299. EMBERIZOIDES HERBICOLA SPHENURUS (Vieillot).

Six specimens, both sexes, adult and immature, Vicinity of Paramaribo, March, April, May, and June.

300. CORYPHOSPINGUS CUCULLATUS (P. L. S. Müller).

One adult ♂, Rijsdijkweg, April.

301. ARREMON SILENS (Boddaert).

Four adults, ♂♂ and ♀♀, Vicinity of Paramaribo, and Lelydorp, March, and May.

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PARASITIC HYMENOPTERA FROM THE BRITISH SOLOMON ISLANDS COLLECTED BY DR. W. M. MANN.

By Charles T. Brues.

With One Plate.

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No. 3.— *Parasitic Hymenoptera from the British Solomon Islands collected by Dr. W. M. Mann.*

By Charles T. Brues.

CONTRIBUTIONS FROM THE ENTOMOLOGICAL LABORATORY OF THE BUSSEY INSTITUTION, HARVARD UNIVERSITY, NO. 141.

Until a few years ago the Hymenoptera of the Solomon Islands remained practically unknown. In 1909, Mr. W. W. Froggatt secured a small collection on the islands and these have been studied by several workers. The parasitic forms were examined by Cameron (Proc. Linn. soc. N. S. W., 1911, **36**, p. 349–365), who found seventeen species, all of which he described as new. At least one of these (*Echthromorpha pallidilineata*) had been previously recorded under another name from the Pelew Islands. In the collection obtained by Dr. Mann there are 32 species which I have been able to study satisfactorily. Six of these are identical with ones described by Cameron from the Solomons; two are forms occurring in New Guinea; one was described years ago by Westwood from the Solomons, and two are rather widespread Indo-Malayan species.

Many of the genera are world-wide; several range through India and the Malay region. One, Lissopimpla, is Australian, although it extends to Ceylon, and *L. erythropus* is therefore an Australian type, even if it be not specifically identical with *L. scutata* Krieg. from Queensland as has been suggested by Morley.

Among the bees of the Solomons, Cockerell (Proc. Linn. soc. N. S. W., 1911, **36**, p. 160) has pointed out general Indo-Malayan affinities with "a genuine Australian element" and this is equally true of the parasitic Hymenoptera, so far as the material and published records go. It may be of interest to note that *Meroglossa tetraxantha* Ckll., a bee mentioned by Cockerell as belonging to a typically Australian genus was also taken by Mann, who secured a single specimen on the island of Yandina, showing that the species is probably a common one in the Solomons.

I have attempted to gather together a list of the parasitic Hymenoptera so far reported from the Solomon Islands and their neighbors as far as the Bismarck Archipelago on the northwest and New Caledonia on the southeast. It is evident that the grouping of these islands with the omission of New Guinea is to a great extent one of convenience only. Many more Papuan species will undoubtedly be found in the Solomons and the meagre list from all the small islands will unquestionably be greatly augmented by intensive collecting. However, the mere fact that Mann obtained over one third of the species previously collected by Froggatt would seem to indicate that the fauna may not be so very extensive.

STEPHANIDAE

STEPHANUS FROGGATTII Cameron.

Megischus frogattii Cameron, Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 357.

There are six specimens including four females and two males from Auki, Malaita; Tulagi; Fulakora; and Malaili. The larger females from Auki are 26–31 mm. in length and have the accessory femoral teeth better developed than the smaller ones (21–23 mm.). The males measure 20–21 mm.

PARASTEPHANELLUS ORBITALIS, sp. nov.

Type.— M. C. Z., 9,051, and *Paratype.* Solomons: Fulakora. W. M. Mann.

♂. Length 7–8 mm. Black, head pale yellowish from mandibles to just above antennae, the inner orbits narrowly pale to the level of the lower tubercle; posterior orbits, wider above, white; antennae piceous, with the base of the flagellum fuscous; palpi piceous; propleurae rufous below; front legs brownish yellow in front; knees and tips of tibiae of all legs whitish, their tarsi honey-yellow. Wings slightly infuscated. Head rugose, transversely so on front below and on vertex medially; three lower tubercles of vertex about equally developed; intra-ocellar ones much weaker; cheeks smooth, malar space as long as first flagellar joint, not furrowed; hind margin of head carinate, but the carina not strongly developed nor recurved. Third and fourth joints of flagellum of antennae the longest, subequal; second twice as long as first, these two together as long as the third. Pronotum in front transversely wrinkled, the wrinkles extending obliquely on the pleurae; on each side with a coarsely punctate area before the smooth posterior margin. Mesonotum with a median punctate line, the parapsidal furrows forming a semicircle; otherwise sparsely foveate-punctate. Axillae rugose, more finely so laterally, separated basally by a small fovea and from the scutellum by straight oblique, foveate furrows; scutellum smooth along its centre; with coarse, sparse punctures laterally. Propodeum with a few very large irregularly placed shallow punctures, with a smooth longitudinal impression on each side extending to the base of the hind coxa and below this with a coarsely reticulate ridge; its sides below the ridge irregularly wrinkled, nearly smooth. Mesopleurae pubescent in front, smooth and shining behind; obliquely raised at the middle and depressed behind towards the propodeum. Abdominal petiole two thirds as long as the thorax, transversely striate above, irregularly rugose on the sides and below; with some stiff white hairs laterally, the spiracles at the middle. Remainder of abdomen polished. Claspers short, no longer than broad with the apex regularly rounded and beset with a short dense fringe of hairs; smooth basally, punctate and hairy on apical half. Hind coxae transversely striate, with an elongate smooth area externally near the base; femora with a prominent tooth at basal third, middle and apical third; two blunt denticles follow after the basal tooth, several acute ones after the middle tooth and a decreasing series of five after the apical tooth. Stigma rather broad, half the width of the radial cell which is complete except at extreme apex; cubital vein distinct almost to wing tip; transverse median vein inserted one third of its length before the basal vein, so that the petiole of the discoidal cell is very short; second discoidal cell open below, but with the basal and apical sides complete, the vein forming the apical side swollen below the tip.

This is a typical member of the genus and apparently distinct from its congeners, all of which occur in the Indo-Malayan region. In all the genera of this undoubtedly old family the structural characters, particularly of body proportions and sculpture, appear to be very firmly fixed and to show scarcely any variation. I append a key, based mainly on color, which will serve to distinguish the present species from the others.

1. Abdomen and most of body yellowish brown small species 5–8 mm. *P. pygmaeus* Enderl.
   Abdomen, beyond base of second segment, black..............2.
2. Abdomen entirely black..................................3.
   Abdomen, black, the petiole reddish........................6.
3. Head black, orbits white or buff............*P. orbitalis*, sp. nov.
   Head red or red and black, sometimes varied with yellowish...4.

4. Head entirely reddish . . . . *P. martini* Stadlm.
   Head distinctly maculate or varied in color . . . . 5.
5. Wings hyaline, scutellum with foveae at base . . *P. malayanus* Cam.
   Wings smoky, no foveae at base of scutellum.
   P. maculifrons Cam.
6. Legs reddish, head rufopiceous . . . . *P. damellicus* Westw.
   Hind femora and tibiae black; head pale yellowish, blackened above . . . . *P. brevistigma* Enderl.

DIASTEPHANUS SALOMONIS Westwood.

Thesaur. entom. Oxon., 1874, p. 128 (*Stephanus*).

A female from Wai-ai most surely belongs to this species which was briefly described by Westwood from an imperfect example. I have appended a description including the details omitted in the original description.

♀. Length 17 mm. Black with the apical half of the hind femur and constricted part of the hind tibia ferruginous; head with a broad white band extending from the base of the mandible behind the eye nearly to the top of the eye; front with the inner orbits and a median line extending half way to the median ocellus pale yellow; mandibles ferruginous at middle. Face transversely striate below the tubercles; irregularly reticulate between the tubercles; between the ocelli with two transverse carinae; behind them with wavy transverse aciculations and a median groove. Second and third joints of flagellum equal, each nearly twice as long as the first which is considerably longer than the pedicel. Cheeks smooth and shining. Prothorax very long, equalling the length of the fore leg from the base of the coxa to the knee, its constricted portion finely transversely wrinkled; its posterior margin smooth, preceded by a band of transversely elongated punctures; mesonotum in front irregularly rugose reticulate, smooth behind except for the crenate parapsidal furrows. Propodeum above with coarse thimble-like punctation. Propleurae finely shagreened; mesopleurae smooth above and below, between and in front with a band of large incompletely impressed punctures. Metapleura reticulate above, below with some incomplete vertical wrinkles. Abdominal petiole as long as the head and thorax, transversely striate above and below except at extreme base; hind coxae similarly striated. Hind femur with serrate projections before the middle where it bears a large tooth, behind this with three denticles, another large tooth, then a decreasing series of eight denticles. Ovipositor as long as the body, its sheaths entirely black. Wing-venation typical for the genus, the upper and outer edges of the discoidal cell indicated by slight brown streaks.

Considering the size 17 mm., the locality[1] and the agreement so far as Westwood's description goes, I think this is undoubtedly his species. It is not, however, the same as Schletterer's *Stephanus pallescens* from the Philippines which its author suggested might be Westwood's species. Westwood gives 10½ lines as the alar expanse which is about right for a species 17 mm. in length, but not for one 11 mm. in length, the size given for *S. pallescens* although species of this group sometimes vary considerably in size. The present form differs conspicuously from *S. pallescens* in the form of the antennal flagellum and pedicel.

EVANIIDAE.

TRIGONOFOENUS SALOMONIS, sp. nov.

Type.—M. C. Z. 9,052. Solomons: Malaita, Auki. W. M. Mann.

♀. Length 16 mm., ovipositor 20 mm. Black, with deeply infuscated wings; four anterior femora, tibiae, metatarsi, and second joint of trochanters, ferruginous; first joint of these trochanters, second joint of hind ones and hind tibiae fuscous, base of hind tibia yellowish; hind tarsi orange-yellow at base shading to almost white at tip. Face minutely, confluently punctate; front minutely, somewhat transversely aciculate; ocelli large, the lateral ones about their own diameter from the eye, malar space well developed, as long as the width of the mandible at base, clypeus with the lateral angles slightly prominent, medially broadly emarginate; cheeks and temples very finely and closely punctate; vertex like the front; occipital margin rather sharp and slightly recurved. Third joint of antennae no longer than the second; fourth over three times as long as second and nearly five times as long as thick; following gradually decreasing in length. Prothorax short, not so long as the distance from humerus to tegula. Thorax short, the mesonotum as broad as long; parapsidal furrows oblique, nearly straight, meeting at posterior fourth of mesonotum and from thence prolonged to the scutellum as a median groove; median lobe transversely rugose, more coarsely so on the sides; lateral lobes and scutellum finely rugose. Propodeum deeply reticulate, the spaces rather regular, nearly circular; entire thorax almost without pubescence. Pleuræ coarsely rugose-reticulate, finer on the mesopleura above near the tegulae and on the base of the sides of propodeum. Abdomen subshining, uniformly blackish; sheaths of ovipositor tipped with white. Legs with the hind coxae coarsely transversely rugose above and externally, finely punctate below; hind tibiae less swollen than usual, but little thicker than the femora; their tarsi stout, the first joint distinctly longer than the following together, both the hind tarsi and their tibiae at tip conspicuously clothed with golden pubescence. Radial cell broad, the radius sharply bent upwards at its apical third; small discoidal cell almost as long as its petiole.

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[1] Westwood gives "Solomon's Island (New Hebrides)."

Of the species referred to this genus by Kieffer, this comes closest to *T. abuensis* Cam. from India, from which it differs in its clear wings and differently colored legs. It is also quite different from any species of Gasteruption known from this region, aside from the generic differences which do not appear to be very clear-cut, at least when applied to our American species.

Braconidae.

Spathius manni, sp. nov.

Type.—M. C. Z. 9,053. Solomons: Wai-ai. W. M. Mann.

♀. Length 7.5 mm., ovipositor 3 mm. Black; head below the level of the antennae dark reddish brown; antennae yellowish at base, brown beyond: palpi piceous; tarsi brownish yellow; posttegulae white, seventh and eighth segments of abdomen yellow; wings fuscous, with a hyaline cross-band near the base and a hyaline streak extending across from the base of the stigma; apex hyaline; veins black, stigma white at base. Head seen from above, as wide as thick, full behind the eyes, then roundly narrowed to the prominent posterior carina; eyes rather large, as wide as the cheeks, the malar space two thirds the length of the third antennal joint; eyes slightly emarginate opposite the antennae; ocelli in a nearly equilateral triangle, posterior ones nearer to one another than to the eye-margin. Mouth opening gently concave above, the clypeus separated, with deep lateral foveae. Face transversely rugose; front and vertex evenly transversely aciculate; back of head above middle of eyes horizontally aciculate, the aciculations curving upwards to meet those of the vertex; cheeks smooth. Antennae slightly longer than the body, flagellar joints regularly decreasing in length; first one fourth longer than the second; maxillary palpi nearly twice the length of the head. Prothorax with the posterior margin strongly carinate. Thorax long and narrow; mesonotum slightly longer than the propodeum and one half longer than wide, its surface shagreened; parapsidal furrows deep; coalescing at the middle to form a transversely areolate depression. Scutellum with six small elongate pits at the base, its surface shagreened. Propodeum transversely rugose-reticulate; with a median carina that forks just before the middle to form a long petiolar area extending to beyond the middle; spiracle small, circular; below it a complete carina with an incomplete one below that. Pro- and mesopleura irregularly striate and reticulate, the mesopleura with a shagreened area at the middle below. Petiole of abdomen as long as the thorax from posterior angle of propleura to tip of propodeum; slender, scarcely bent, slightly widened at the spiracles and again after posterior fourth, the apex twice as wide as at spiracles which are at basal third; its surface rugose medially, striate-reticulate on the sides, more finely striate toward apex. Second segment microscopically transversely aciculate, more distinctly so at base, as long as wide at apex which is twice as wide as base; third to fifth minutely roughened with a polished band at base; sixth polished; seventh longitudinally striate on basal half. Legs comparatively slender; hind coxae finely shagreened above, their femora four times as long as thick. Front tibiae finely spinulose on their anterior surface; middle ones minutely denticulate; hind ones minutely tuberculate on hind edge. Submedian cell slightly longer than the median, recurrent nervure received at base of second cubital cell; subdiscoidal vein interstitial.

This species is quite distinct in size and color from any others known from the Indo-Malayan region.

SPATHIUS MELLEUS, sp. nov.

Type.—M. C. Z. 9,054. Solomons: Rio. W. M. Mann.

♀. Length 2.7 mm.; ovipositor 1 mm. Honey-yellow, the thorax somewhat darker than the head, abdomen, and legs; antennae blackened beyond middle; wings yellowish hyaline, with a faint cloud just before and another just beyond the middle. Head as broad as thick, scarcely widened behind the eyes, hind margin strongly carinate.

Eyes a little longer than wide, slightly broader than the cheeks. Anterior margin of clypeus strongly concave; face shining, with rather faint irregular sculpture and a median elevation from the clypeus to the base of the antennae; malar space nearly as long as the third antennal joint; front below the ocelli weakly arcuately aciculate; ocelli in a nearly equilateral triangle, posterior pair almost twice as far from one another as from the eye-margin; head above ocelli highly polished, faintly coarsely shagreened; head behind smooth and polished. Antennae with the joints of the flagellum gradually growing shorter, the second scarcely shorter than the first. Pronotum with a strong transverse carina, just behind the raised anterior margin and with a weaker one at the middle. Mesonotum short, no longer than wide, coarsely shagreened; parapsidal furrows complete, bounded interiorly on their posterior half by a raised line, the space between not reticulate. Scutellum with a deep crenate groove at base. Propodeum areolated as in *S. manni*, but with the superomedian and petiolar areas separated and the surface more coarsely sculptured and more shining. Petiole of abdomen stout, considerably curved above, as long as the propodeum to the root of the hind wing, evenly widened from base to apex where it is less than twice as wide as at spiracles; coarsely striate above and on the sides. Second segment with a row of short longitudinal striae at base, followed by an area of very faintly impressed large punctures; apex polished. Following segments smooth, polished. Propleura irregularly reticulate; mesopleura shagreened, with a small reticulate space in front above. Legs stout; hind coxae shagreened, their femora three times as long as thick; none of the tibiæ with denticles or tubercles. Recurrent nervure received near the base of the second cubital cell: submedian cell barely longer than the median; subdiscoidal vein interstitial.

This species is somewhat similar in size and color to the Papuan *S. minutus* Szep., but lighter, with the metathorax not black; the mesothorax shows no transverse sculpture and the head is entirely smooth.

ACANTHORMIUS Ashmead.

Proc. U. S. N. M., 1906, **30**, p. 200.

There is a small species in the material before me which is either referable to this genus or represents a closely allied one. As will be seen from the following description the general form and peculiar structure of the abdomen are very similar to *A. japonicus* Ashm., but the armature of the third abdominal segment is not like that of the type-species. It will easily run down to the genus in Ashmead's Genera of Ichneumon flies[1] and his emendation of the same[2] given in connection with the description of the genus. In habitus the species is very much like a Chelonus, but is structurally very different.

ACANTHORMIUS DUBITATUS, sp. nov.

Type.—M. C. Z. 9,055. Solomons: Three Sisters, Malapaina. W. M. Mann.

♀. Length 2.3 mm. Uniformly ferruginous, the legs and three basal joints of antennæ pale yellow. Face evenly convex, smooth and shining; malar space one third as long as the eye; clypeal emargination deep, leaving a large semicircular opening above the mandibles. Front and posterior part of head polished, the latter very strongly margined. Antennae 21-jointed; scape short, oval; pedicel more than half as large as the scape; flagellar joints long, gradually decreasing in length toward apex, basal ones cylindrical, apical ones becoming more or less lanceolate. Mesonotum highly polished with deep crenulate parapsidal furrows that converge and meet before the scutellum; also with a median furrow impressed only behind; scutellum with two large, quadrate, nearly confluent foveae at the base. Propodeum areolated, the superomedian area an equilateral triangle connected with the anterior margin by a median carina, petiolar area pentangular, long, narrowed below. Abdomen consisting of three segments, the second longest, about as wide as long; third a little shorter; first one third shorter; upper surface coarsely longitudinally striated or wrinkled; third segment deeply emarginate at apex and also at the middle of each side, with a small tooth just preceding the lateral emargination; venter pale; ovipositor shorter than the first segment. Propleura with several coarse striae below, mesopleura convex, polished, with a few coarse striae converging from the upper anterior margin toward the centre of the disc; below with a deep elongate impression and just inside the posterior edge with a crenate line; metapleura coarsely rugose. Wings nearly hyaline, with pale brown veins; submedian cell slightly longer than the median; stigma elongate; second section of the radius one third longer than the first;

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[1] Proc. U. S. N. M., 1900, **23**, p. 148.

[2] Ibid., 1906, **30**, p. 200.

radial cell nearly attaining the wing-tip; recurrent nervure interstitial with the first transverse cubitus; submedian cell of hind wing fully half as long as the median.

PLATYBRACON SZÉPLIGETI.

Dr. Mann obtained three species of this remarkable genus on Fulakora. Two species have already been described from the neighboring islands; the type of *P. depressus* Szépligeti from New Guinea and since recorded by him from Aru; the second one *P. insularis* by Cameron from the Solomon Islands. Cameron's species appears to be represented in the collection by 16 specimens. I cannot be positive as the original description is rather incomplete although it fits these specimens so far as it goes. The other two are, I think, perfectly distinct and undescribed. All, however, are very similar, including the Papuan species. The following key will serve to distinguish them.

1. Fourth abdominal segment with a distinct striate or rugose sculpture; antennae entirely black........................2.
   Fourth abdominal segment smooth and shining; antennae ferruginous apically..3.
2. Fifth and following abdominal segments rugosely sculptured, the anterior corners of the third and fourth segments rugose. *P. depressus* Szép.
   Fifth and following segments smooth, anterior corners of third and fourth segments smooth..............*P. insularis* Cam.
3. Frontal projection below base of antennae small, in profile projecting only half as far forward as the mandibles; raised area of 1st abdominal segment three times as long as broad. *P. debilis,* sp. nov.
   Frontal projection large, extending as far forward as the mandibles; raised portion of first segment a little over twice as long as broad..................................*P. fortis,* sp. nov.

PLATYBRACON INSULARIS Cameron.

Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 353.

Sixteen specimens, all females, vary in length from 8.5 to 12 mm. but are very uniform in sculpture and in the small size of the facial projection. The raised portion of the first abdominal segment is broad, but little over twice as long as broad and widest near the middle.

PLATYBRACON DEBILIS, sp. nov.

Type.—M. C. Z. 9,056 and *Paratype*. Solomons: Fulakora. W. M. Mann.

♀. Length 9–11 mm. Pale fulvous, the tips of the mandibles, basal three fifths of antennae, ocellar area, and sheaths of ovipositor black; apical two fifths of antennae ferruginous; last tarsal joint fuscous. Wings black, with a pale fulvous basal band as wide as the length of the stigma and a hyaline spot beneath the stigma including most of the first cubital and the extreme base of the radial cell; veins black except at the base of the wing and the first section of the radius which is fulvous; stigma yellowish white. Head a little wider than long, broad and rounded off behind, the part behind the eyes nearly as long as the eyes; malar space shorter than the third antennal joint; transverse ridge below base of antennae poorly developed, but little projecting; above it is a median raised line extending between the antennae and continuing to the ocelli as an impressed line. Antennae 56-jointed. Mesonotum, scutellum, and propodeum smooth and shining, the latter without striae apically, but with the usual groove just outside the spiracle. First abdominal segment as long as broad, its raised portion weakly and irregularly striated, gradually widened behind, three times as long as broad, lateral portions very unevenly longitudinally striate. Second segment over twice as long as broad, its oblique furrows straight, weak, scarcely crenulated, extending two thirds across the segment where they widen out and disappear; lateral areas smooth; middle one coarsely striate except along hind margin; anteriorly with a narrow raised area which extends backward to a point at the posterior third of the segment. Third segment sculptured like the second, but more weakly, without the narrow median portion and with the oblique furrows curved, so that they terminate at the middle of the lateral margins of the segment. Fourth and following segments smooth; the fourth with a curved oblique furrow like the one on the third. Ovipositor a little shorter than the body. Legs stout as usual. Wing-venation as in the other species.

Two specimens, type and paratype from Fulakora, British Solomon Islands, W. M. Mann.

PLATYBRACON FORTIS, sp. nov.

Type and Paratype.— M. C. Z. 9,057. Solomons: Fulakora. W. M. Mann.

Later two additional females were received by Dr. Mann from Mr. Chas. Bignell, collected at Fulakora.

♀. Length 11–14 mm. Similar to the preceding but with the projecting ridge below the base of the antennae much more highly developed and projecting as far forward as the mandibles when seen in profile. The raised portion of the first abdominal segment is also broader in proportion to its width, only a little over twice as long as broad.

It is possible that this species may be only a well-marked form of the preceding.

Dr. Mann tells me that all the Platybracon which he obtained were flying about felled trees in the forest, so that it is probable that the members of the genus are parasitic on the larvae of wood-boring insects.

IPHIAULAX (ATANYCOLUS) BIGNELLI, sp. nov.

Type.— M. C. Z. 9,058. Solomons: Isabel, Fulakora. Charles Bignell.

♀. Length 16 mm., ovipositor 20 mm. Black; the head yellow except ocellar area; pro- and mesothorax, scutellum and four anterior legs fulvous; wings black, the stigma fulvous on basal half; clear spot below stigma present, but not very prominent. Head one third broader than thick, rounded behind, the temples nearly as broad as the eyes. Face rugose, opaque; malar space one third as long as the eye; no keel between antennae; frontal depression with a narrowly v-shaped median elevation. Prothorax above very finely punctate; mesonotum with distinct furrows anteriorly, smooth and polished; scutellum finely punctate behind: metathorax with a few fine scattered punctures, shining. First abdominal segment one half longer than wide at apex, with a high ridge at each side on the basal third enclosing a deep impression; behind the spiracle this ridge curves down to form a lateral carina which is bounded internally by a crenulated furrow, disc of segment strongly elevated, smooth and shining, without carinae; medially behind with a rounded rugose area. Second segment with a finely, irregularly striated median field anteriorly defined by two curved raised lines which meet before the middle of the segment and continue to the apex as a strong median carina; also with an oblique carina on each side from the anterior angle to the posterior margin enclosing an obliquely rugose area, external to this is another similar rugose area that extends only to the middle of the segment. Third segment irregularly longitudinally rugose on basal third, without very distinctly separated anterior angles; fourth segment smooth except at extreme base, anterior angles not separated; following segments entirely smooth and shining. Pleurae smooth except for some delicate oblique aciculations on the propleura anteriorly and for a few fine scattered punctures on the metapleura. Last ventral segment prominent. Outer edge of stigma nearly twice as long as the inner; recurrent nervure received at apical fifth of first cubital cell; second section of radius three times as long as the first.

This species is similar to the Papuan *I. nova guinensis* Szép., but differs greatly in the sculpture of the abdomen, especially on the first segment.

AUSTROÖPIUS NOVA GUINEËNSIS Szépligeti.

Termes. füzetek, 1900, **23**, p. 64.

There is one specimen from Ugi, British Solomon Islands. The species was originally described from New Guinea.

CARDIOCHILES SIMILIS, sp. nov.

Type.—M. C. Z. 9,059. Solomons: Santa Cruz, Graciosa Bay. W. M. Mann.

♂. Length 4.5 mm. Black, conspicuously clothed with white pubescence, especially on the posterior part of the mesonotum and the scutellum. Mandibles, except base and apex ferruginous; anterior legs with the tips of the femora and the tibiae and tarsi fulvous; spurs of four posterior tibiae whitish; palpi piceous; first abdominal segment reddish at the sides; posterior margins of segments 2–4 whitish. Wings deeply infuscated, with a subhyaline band across the middle. Head slightly more than twice as broad as thick, the occiput scarcely excavated; eyes densely hairy, their inner margins weakly convergent below; malar groove almost as long as the width of the mandibles at base; face shining, minutely punctate, without median carina, but with a small median tubercle below the antennae; face, including clypeus, not higher than broad; vertex smooth and shining; ocelli separated by less than their own diameter. Antennae 35-jointed, slender, the joints at the middle nearly half longer than thick. Mesonotum shining, the parapsidal furrows very sharp and crenulate, but narrow; basal groove of scutellum broad, deep and coarsely crenulate. Propodeum smooth in front, coarsely reticulate behind where it is areolate, but irregularly so, the sculpture concealed by the pubescence. First abdominal segment with two longitudinal grooves separating a median portion that is strongly elevated behind; second segment before the transverse groove elevated, but without a median raised area. Propleurae striate below, irregularly punctate above; mesopleura with an irregularly punctate space near the top and below the middle, with a punctate line inside the posterior margin; metapleura smooth; sides of propodeum reticulate. Legs stout. Cubitus arising at the middle of the basal vein; first section of radius shorter than upper section of basal vein.

This species may be the same as *C. fasciatus* Szép. from New Guinea, but it is impossible to tell from the original description (Termes. füzetek, 1900, 23, p. 60) which omits the structural details of the Papuan species.

BRACON (CREMNOPS) SALOMONIS, sp. nov.

Type and Paratype.—M. C. Z. 9,060. Solomons: Santa Cruz, Graciosa Bay. W. M. Mann. A fourth specimen from Auki has the abdomen entirely yellow.

♂. Length, 7–8 mm. Pale fulvous, marked with black, the mandibles and venter more or less luteus. Head, except for a small ferruginous dot at middle of face, and antennae, black; teeth of mandibles, apical third of hind tibiae and hind tarsi, except extreme base of the joints, black; fifth and also usually the fourth segment of abdomen with a large transverse dark brown or black stain; wings black, the stigma brown basally and the parastigma luteus; discoidal cell with an irregular curved hyaline mark at the base. Head approximately as broad as high; malar space as long as the eye; front shining, finely punctate, almost straight in profile; frontal carinae extending to the lateral ocelli, but not so sharp on their inner half; maxillary palpi one half longer than the labial ones; antennae 40-jointed, scape, simple at apex; third joint distinctly longer than the fourth. Lateral pits of pronotum separated by a narrow median space. Middle lobe of mesonotum with two narrow impressed lines; parapsidal furrows deep, broad and finely reticulated anteriorly. Propodeum with the superomedian area contracted to a point in front, so that it is narrowly triangular; petiolar area subtriangular, as broad as high; in all there are six longitudinal carinae, one strong complete transverse one at apical third and the supermedian and adjacent lateral areas bear four less strongly elevated transverse carinae. Propleurae smooth, with a series of coarse shallow punctures along the hind edge; mesopleura very finely and sparsely punctate, the groove in front of middle coxa almost obsolete; metapleura finely punctate, the punctures well separated. Abdomen highly polished; first segment twice as long as broad at apex which is twice as broad as the base; second segment with a large, oval, weakly convex space at the base. Tarsal claws bifid on all the legs, those of the front tarsi pectinate at the base; hind tibiae with two spines near the base of the spurs; longer spur nearly half the length of the metatarsus. Wings with normal venation; the second cubital cell about two thirds as long above as below.

This species is quite similar to two known from New Guinea; one of these was described by Szépligeti [1] as *Cremnops bicolor*, but as the name *bicolor* has been used by Brullé [2] for an African species of Bracon (*sensu auctorum*), I therefore propose the name *erimensis*, nom. nov. for Szépligeti's species. The second species, *B. xanthostigma*, may be known as *B. nova guineënsis*, nom nov. as *B. xanthostigma* has been used by Cresson [3] for an American species of Bracon (*sensu auctorum*). The present species differs from *B. erimensis* by its shining face, incomplete ocellar carinae, and in color, although a variety described later by Szépligeti [4] is more similar in color. From *B. nova guineënsis* it differs by the triangular superomedian area and in color.

Cameron [5] has described *Agathis fulgidipennis* from the Solomon Islands and this is evidently quite similar to the present Bracon in appearance. However, as the two genera are both well known as distinct and separable on the form of the tarsal claws, I cannot believe that they could be the same. The present species is also similar in color to the Papuan *Euagathis variceps* Cameron, and to *Bracon* (*Agathis*) *fumipennis* Smith.

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[1] Termes. füzetek, 1900, **23**, p. 60.

[2] Hist. nat. ins. hym., 1846, **4**, p. 412.

[3] Proc. Ent. soc. Philadelphia, 1865, **4**, p. 303.

[4] Termes. füzetek, 1902, **25**, p. 66.

[5] Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 356.

DISOPHRYS FUMIPENNIS Smith.

Journ. proc. Linn. soc. Zool., 1859, **3**, p. 176.

Two females from Tulagi probably represent a color-variation of this species which is known also from Aru and New Guinea. The body is entirely luteous, with the antennae, tips of hind tibiae, and entire hind tarsi black. The wings are much lighter basally and the stigma is yellow on the basal half.

CHELONUS SALOMONIS Cameron.

Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 355.

One specimen from Rere.

PHANEROTOMA LONGIPES Szépligeti.

Termes. füzetek, 1900, **23**, p. 59.

A single specimen from Tulagi.

ICHNEUMONIDAE.

ERYTHROPIMPLA NIGRA, sp. nov.

Type.— M. C. Z. 9,061 ♀. Solomons: Rio. W. M. Mann.

♀. Length 13 mm. Black, marked with pale yellow as follows: lower surface of antennal scape, palpi, four anterior legs, except coxae and base of trochanters of middle pair, tegulae, and antetegulae; wings deep yellow on basal two fifths, blackish beyond, veins yellow at base, black beyond, stigma black. Head very transverse, three times as broad as thick; ocelli large, in a small triangle, the lateral ones less than their diameter from the median one and from the eye-margin. Eyes long, touching the mandibles below, deeply emarginate opposite the antennae, strongly convergent for a distance below; face sparsely, finely punctate; clypeus separated by a straight line, its anterior margin deeply emarginate; front and head behind shining and scarcely punctate. Antennae with the first flagellar joint nearly as long as the second and third together, the latter subequal, twice as long as thick; following decreasing in length, becoming quadrate near the middle of the flagellum. Mesonotum punctate, confluently medially, but sparsely on the sides; parapsidal furrows impressed anteriorly. Scutellum strongly convex, nearly truncate behind, coarsely sparsely punctate and clothed with brownish hair as is also the propodeum. Propodeum coarsely densely punctate in front and at the sides, but with a median smooth stripe anteriorly and a large, oval, smooth area behind. Propleura smooth, except for a few punctures near the upper edge; mesopleura sparsely punctate, with a densely punctate space near the tegula and a large smooth area above and behind; with a vertical grooved line extending from the sternum almost to the upper margin opposite the middle of the tegula; sides of propodeum scarcely punctate; spiracle large, oval; metapleura smooth and shining. Abdomen coarsely punctate, more deeply and closely so on the second to fifth segments, except along apical margin; first segment with two strong convergent carinae that almost meet to form a triangular area at the base of the segment; second to fifth each with a basal and subapical transverse constriction, the latter curving forward medially; apical segments without distinct constrictions. Venter white. Ovipositor nearly as long as the abdomen, its sheaths very strongly hairy. Legs moderately stout; tarsal claws with a large, subacute lobe at the base. Stigma very narrow, submedian cell slightly shorter than the median; areolet large, obliquely triangular, subpetiolate above, receiving the recurrent nervure just before apex; transverse discoidal vein in hind wing broken at its lower fifth.

This species will run to either *E. calliptera* Sauss. or *E. pseudoptera* Morl. in Morley's key to the species of Hemipimpla (including Erythropimpla) from both of which it is abundantly distinct.

ECHTHROMORPHA SEMPERI Krieger.

Mitt. Zool. mus. Berlin, 1908, p. 329.
Cameron, Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 362 (*pallidilineata*).
Morley, Revision Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 48.

Seven females and ten males from Tulagi; one male from Rere. The females vary in size from 13 to 18 mm., and the males from 8–16 mm. The antennae are blackened on the apical third, especially in the female, but otherwise the specimens agree closely with Cameron's description.

Megarhyssa picea, sp. nov.

Type and Paratype.— M. C. Z. 9,062. Solomons: Malaita, Auki. W. M. Mann.

♀. Length 19–20 mm.; ovipositor 25–30 mm. Body piceous, varied to only a small extent with lighter color; cheeks and lower posterior orbits fuscous; first three joints of antennae fuscous below, joints 16–19 pale yellow; sides of face below, broader near clypeus, yellow; clypeus, anterior legs, middle and hind femora and tibiae, obscure lateral blotches near apex of first, third, fourth, fifth, and sixth abdominal segments dull reddish brown. One lighter specimen has the orbits yellow for a short distance above the antennae, the posterior orbits yellow, the propodeum and first abdominal segment dull ferruginous, the legs bright ferruginous and yellow spots at the upper edge of propleura, below tegula, at apex of first abdominal segment, and small obscure yellow spots on the sides of segments three to six. Wings brownish, paler at apex and with a blackish fascia, narrowed behind, extending from the costal margin to the discoidal vein, including the basal half of the radial cell and the apical half of the third discoidal cell. Head fully twice as wide as thick, narrowed behind the eyes, in vertical view with the temples one third as wide as the eyes; cheeks but little wider than the temples; face smooth and shining; clypeus with a small median acute tubercle at the middle of its lower margin and another at each lower angle. Flagellar joints gradually decreasing in length, the first distinctly longer than the second. Mesonotum with the usual coarse transverse striations; scutellum transversely rugose-punctate; propodeum shining, not punctate on the sides; its spiracles oval, only twice as long as broad. Propleura entirely smooth; mesopleura smooth above and behind, finely punctate in front; metapleura with small rather closely placed punctures. Abdomen polished, without fine sculpture; petiole scarcely twice as long as broad, widest at basal fourth behind which it is slightly narrowed; second segment twice as long as the first, fully twice as long as wide; third to fifth segments deeply emarginate behind. Legs as usual. Wings with the submedian cell distinctly longer than the median; areolet large, obliquely triangular, petiole about half the height of the areolet; recurrent nervure intestitial with the second transverse cubitus; cubito-discoidal vein in hind wing broken at its upper fifth.

This species is quite distinct in color from the several others known from the Indo-Malayan region. In Morley's key it will run to *M. instigator* Sm. or to *M. tridentata* Cam. which he considers synonymous. From Tosquinet's very lengthy description (Mem. Soc. ent. Belg. 1903, **10**, p. 97) of *M. instigator* it differs in the sculpture of the face, form of clypeus, and more slender abdominal petiole. From *M. tridentata* (Proc. Zool. soc. London, 1901, 1, p. 230) it differs in the sculpture of the face, propodeum, and metapleurae, dark scutellum, etc.

CYANOXORIDES SPLENDENS, sp. nov.

Type.—M. C. Z. 9,063. Solomons: Fulakora. W. M. Mann.

♀. Length 11 mm. Dark metallic blue; antennae black with joints 11–16 white (apical joints broken off) front and middle tibiae fuscous, their tarsi brownish yellow; hind coxae and femora ferruginous, their trochanters black, their tibiae black with a broad, indistinctly defined, pale brown annulus near base, their tarsi pale testaceous. Wings hyaline with a fuscous band, wider behind, including the basal vein and transverse median nervure, and a second band, fading out posteriorly which extends over the basal half of the radial cell; veins black, stigma pale at base. Head nearly twice as wide as thick, sharply narrowed behind the eyes; ocelli in a nearly equilateral triangle, the posterior pair about half farther from the eye-margin than from one another; face broadly protuberant below the antennae, closely punctate; interantennal keel prominent; antennae slender, the basal flagellar joints five or six times as long as thick, the flagellum hairy, especially beyond the first few joints; mandibles without teeth; front and vertex highly polished almost impunctate except at the sides below the ocelli; cheeks and malar space irregularly vertically striate through the coalescence of rows of elongated punctures; malar space half as long as the first flagellar joint. Mesonotum with weakly impressed parapsidal furrows; densely punctate with an area on each side that is sparsely punctate. Scutellum convex, rugosely punctate with a small median smooth depression on its apical half. Propodeum rather evenly convex above; coarsely rugose-punctate; areolated; median areas not separated from each other; basal and apical lateral areas completely defined; pleural space defined by a carina below it; spiracles linear. Propleura coarsely punctate above, smooth below; mesopleura coarsely punctate, confluently so near the middle coxa; metapleura rugose. Abdomen subpetiolate, the first segment slightly longer than the propodeum and scutellum together, its base one fourth as wide as the apex; its surface very coarsely punctate, rugose medially and with a patch of oblique striae at the inner end of the oblique grooves; spiracles distinctly before the middle. Second segment slightly more than half as long as the first, broadest behind and distinctly shorter than wide; with a curved impression on each side that extends from the middle of the anterior margin to the middle of the lateral one; anterior corners separated by a short, deep oblique groove, surface confluently punctate on the raised portions and obliquely striate on the depressed parts. Third segment shorter than the second and similarly sculptured, but with much less evident striae; following segments smooth and shining. Hind legs very long, with the coxae and femora thickened; front tibiae twisted and constricted at the base; tarsal claws simple. Ovipositor as long as the body. Submedian cell distinctly shorter than the median; transverse cubitus long, one third the length of the recurrent nervure; transverse discoidal vein in hind wing broken below the middle.

To judge from the generic description of Cyanoxorides, this species is atypical in having a more nearly petiolate abdomen, with the spiracle of the first segment placed before the middle. It is so typical in all other respects, however, that it is undoubtedly congeneric with Cameron's species.

ENICOSPILUS Stephens.

There are four species of this genus in the collection, three of which are apparently undescribed, together with *E. salomonis* Cameron. They may be distinguished by the following key.

1. Submedian cell of same length as the median; abdomen black beyond second segment; wing-venation very dark. Plate **1**, fig. 1. *E. fulacorensis*, sp. nov.
Submedian cell shorter than the median; abdomen entirely reddish; wing-venation brown..............................2.
2. Propodeum finely sculptured; cubito-discoidal cell with two widely separated, chitinous spots, one near each end of the first section of the radius. Plate **1**, fig. 4..........*E. salomonis* Cam.
Propodeum coarsely reticulate, especially toward apex; chitinous spots not as above....................................3.
3. Recurrent nervure as long as the transverse cubitus; metapleura finely, closely punctate. Plate **1**, fig. 3. .*E. approximatus*, sp. nov.
Recurrent nervure nearly twice as long as the transverse cubitus; metapleura irregularly sculptured, more or less rugose and striate. Plate **1**, fig. 2............. ....*E. malaitensis*, sp. nov.

ENICOSPILUS FULACORENSIS, sp. nov. Plate 1, fig. 1.

Type.—M. C. Z. 9,064. Solomons: Fulakora. W. M. Mann.

♀. Length 22 mm. Light reddish brown; abdomen piceous beyond the second segment; front and middle legs beyond the coxae, hind trochanters, knees, tibiae, and tarsi, and mandibles except tips dull yellow; flagellum of antennae black; sides of face and front, and posterior orbits pale yellow; wings hyaline, with the venation piceous, almost black. Face very finely and sparsely punctate, clypeus smooth and polished; malar space a little shorter than the thickness of the third antennal joint. Mesonotum not distinctly punctate. Scutellum carinate laterally, the carinae straight, twice as far apart at base of scutellum as at apex; apical half coarsely longitudinally striate. Propodeum smooth and shining before the carina, behind this evenly rugose-reticulate, the reticulations rather distinctly oblique. Mesopleura longitudinally finely striate below, indistinctly so above; metapleura coarsely striate below, finely so above. Posterior tibiae with a few dark bristles externally in addition to the yellow pubescence. Median cell as long as the submedian; chitinous spot in cubito-discoidal cell prolonged apically as a curved line almost to the radius; first section of radius thickened on the basal two thirds; base of third discoidal cell half as long as the apex of the second discoidal; discoidal vein in hind wing broken at lower third.

Type from Fulakara, British Solomon Islands, Wm. M. Mann.

This species is very similar in color to *E. nigrinervis* Cameron from New Britain, but differs at once in the length of the submedian cell and longitudinally striate scutellum.

ENICOSPILUS MALAITENSIS, sp. nov. Plate 1, fig. 2.

Type.—M. C. Z. 9,065. Solomons: Malaita. W. M. Mann.

♂. Length 22 mm. Light yellow-brown, the antennae fuscous toward tips; inner orbits above pale yellow. Wings hyaline, veins fuscous. Face finely closely punctate, clypeus more sparsely so, especially below. Malar space slightly longer than the diameter of the first flagellar joint. Mesonotum closely, very finely punctate. Scutellum with straight lateral carinae, its surface finely punctate, without striae, rather broad, twice as wide in front as at apex. Propodeum smooth and impunctate before the carina, coarsely reticulate behind it. Mesopleura finely punctate above, longitudinally aciculate below; metapleura irregularly rugose-striate, without any distinct punctures. Posterior tibiae with a few short bristles externally in addition to the pubescence. Submedian cell much shorter than the median; cubito-discoidal cell with a chitinous triangular spot just beyond the middle, prolonged as a thin line nearly to the radial vein; discoidal vein in hind wing broken at lower third.

ENICOSPILUS APPROXIMATUS, sp. nov.

Plate 1, fig. 3.

Type.—M. C. Z. 9,066. Solomons: Malaita, Auki. W. M. Mann.

♀. Length 20 mm. Uniformly pale yellowish brown, without lighter markings and with only the tips of mandibles and tarsal claws black. Wings hyaline, venation piceous. Face and clypeus polished, not distinctly punctate; malar space only about half as long as the diameter of the first flagellar joint. Mesonotum minutely punctate. Lateral carina of scutellum straight; scutellum not striate toward apex which is half as broad as the base. Propodeum punctulate and shining before the carina, behind it reticulate, much more finely so anteriorly near the carina. Mesopleura below finely closely punctate, not distinctly striate; metapleura finely densely punctate above, sparsely so below. Hind tibiae without fine bristles in addition to the pubescence. Median cell longer than the submedian; cubito-discoidal cell with two chitinous spots close together, the basal one triangular and joined to the apical, arcuate one by an almost imperceptible brown line, discoidal vein in hind wing broken at the lower third.

LEUCOSPIDAE.

LEUCOSPIS MACRODON Schletterer.

There are three specimens of this rather widely distributed species from Fulakora, Auki, and Malaili. Two are quite typical, agreeing in color with the original description and with Papuan specimens, while another is entirely black, except for the antennal scape, an oblique stripe on each side of the front opposite the scape, a spot at the upper angle of the hind coxa, a stripe along the upper edge of the femur, most of the four anterior legs and the posterior tarsi which are yellow or brownish yellow. The melanic specimen is, however, structurally the same as the fully marked specimens.

CHALCIDIDAE.

CHALCIS Fabr.

There are four species of Chalcis in the present collection, including one already described from the Solomons, and another, *C. euploeae*, which is apparently widespread in the Indo-Malayan region. The following key will distinguish the four species.

1. Cheeks, below eye and behind malar carina, with coarse reticulate sculpture; hind femora tricolored, black with rufous spot before apex which is white........................*terribilis*, sp. nov.
   Cheeks punctate or nearly smooth; hind femora bicolored, black with the apex yellow or white.................................2.
2. Four anterior legs entirely lemon-yellow beyond the middle of the femora; hind tibiae entirely yellow except at extreme base. *euploeae* Westw.
   Four anterior legs with the femora black except at tip; all tibiae white or yellow varied with black...........................3.
3. Hind tibiae black, with a white stripe externally except at base; middle tibiae white with a black stripe internally. *C. salamonis* Cam.
   Hind tibiae black, yellow externally at extreme base; middle tibiae black, yellow at base and apex..........*C. piraticus*, sp. nov.

CHALCIS TERRIBILIS, sp. nov.

Type.—M. C. Z. 9,067. Solomons: Rere. W. M. Mann.

♀. Length 5 mm. Black, tegulae with a large white spot; front femora white behind near tip and at extreme tip in front, their tibiae brown with a white streak externally at base and spot at base; middle legs with knees and tip of tibiae yellowish white; hind femora white at extreme apex and with a subapical rufous spot externally, their tibiae externally with a white spot near base and at apex; all tarsi pale brownish yellow. Head above umbilicately punctate; front between antennal cavity and eye with a strong carina extending along lower two thirds of eye; cheeks very coarsely sculptured, irregularly punctate-reticulate; malar carina weak, curving backward before meeting the eye; subgenal and postgenal carinae strong. Antennae very stout, flagellar joints after the second fully twice as wide as long, those near apex nearly three times. Eyes bare; head and body hairs glistening white. Thorax above umbilicately punctate; lateral carinae of prothorax well developed; each as long as the median space between them. Scutellum at apex with a deeply bilobed projection. Abdomen smooth, with very fine punctures on the sides of the third and following segments. Hind femur about twice as long as wide, with a small projection inwardly near base, their inner surface smooth, outer surface very sparsely and finely punctate; about 13 femoral teeth, basal ones, except first, and apical ones smaller than the others. Wings nearly hyaline; postmarginal vein half as long as the marginal and twice as long as the stigmal.

C. terribilis may be known by the configuration of the facial carinae and banner-like color-pattern of the hind femora.

CHALCIS PIRATICUS, sp. nov.

Type and Paratypes.— M. C. Z. 9,068. Solomons: Malaita. W. M. Mann.

♀. Length 3.2–4 mm. Black; the tegulae pale yellow; front and middle knees, tips of tibiae and tarsi honey-yellow; extreme apices of hind femora, ring including basal fourth of tibiae, apex externally of tibiae, and tarsi, yellow. Pubescence of body whitish. Head rugose-punctate above; ocelli in a low triangle, the lateral ones less than their diameter from the eye-margin, eyes bare or nearly so; cheeks smooth; malar carina dividing just below eye, one branch extending along the inner orbit as a light carina, the other branch extending to the hind margin of the head so as to enclose the cheek in the form of a rhomboid between carinae. Antennae rather slender, the middle joints of the flagellum less than twice as broad as long. Thorax closely umbilicately punctate; lateral carinae of pronotum weakly developed, each about as long as the space between them. Scutellum simple, sharply rounded at apex. Abdomen shining, sides of third to sixth segments faintly shagreened, hairy: apical two segments coarsely shagreened. Posterior femora very broad, distinctly more than half as wide as long; internally near base without distinct tubercle, although there is a slight trace of one; underside with about

13 teeth, basal one large, triangular, next small, next larger than the following which form a decreasing series: outer surface finely, closely punctate; inner surface very finely and sparsely punctate. Postmarginal vein one third as long as the marginal and one half longer than the stigmal.

Known from the others occurring on these islands by the almost entirely black hind femora, with minute yellow marking at tip.

CHALCIS SALOMONIS Cameron.

Proc. Linn. soc. N. S. Wales, 1911, **36**, p. 349.

One female from Ugi.

CHALCIS EUPLOEAE Westw.

Trans. Ent. soc. London, 1837, **2**, p. vi Proc.

One specimen from Yandina.

SCELIONIDAE.

SCELIO SETIGER, sp. nov.

Type.—M. C. Z. 9,069. Solomons: Ugi. W. M. Mann.

♀. Black, the four anterior tibiae and tarsi fuscous, front wings strongly infuscated, hind ones hyaline. Front and vertex reticulate, with shallow, thimble-like punctures; a small smooth area above the median ocellus and a triangular smooth space above the base of antennae; reticulations of front below on the sides forming several raised lines that converge toward the base of the mandible; malar furrow nearly half as long as the eye; cheeks and back of head irregularly reticulate, more coarsely so on the cheeks which have no striae of any kind. Head seen from above twice as wide as thick, strongly excavated behind, the lateral ocelli very close to the eye-margin. Antennae stout; scape reaching to level of middle of eye; first flagellar joint one half longer than the pedicel, strongly narrowed basally, slightly over twice as long as thick at tip: three following joints widened, twice as wide as long and really forming a part of the club in form except that they appear to be much more freely movable; basal joints of club fully twice as wide as long. Thorax coarsely rugose-reticulate; mesonotum without parapsidal furrows, although all its reticulations form more or less distinctly longitudinal series. Prothorax smooth, lightly punctured on its contracted part, behind reticulate, with a slight but noticeable tooth at the humeral angle. Scutellum very convex, semicircular, with large punctures forming reticulations, each puncture bearing a short stiff hair or bristle, as do also the punctures of the mesonotum, although here the hairs are not so conspicuous and stout. Metanotum (postscutellum) projecting very slightly as a fluted ridge; propodeum strongly depressed coarsely rugose medially and behind, finely so laterally where it is clothed with dense short whitish hair. Abdomen of the usual form, the first five segments rather regularly longitudinally striate, striae coarser on the first and more irregular on the third segment; apical margin of second to fourth, wider medially on the third and fourth, smooth and shining; sixth segment with deep, large setigerous punctures, third segment the largest, a little wider than long. Propleurae rugose-punctate, more coarsely so behind, mesopleurae with a few very irregularly placed punctures of variable size and shape; sides of propodeum coarsely reticulate anteriorly, finely so behind. Underside of abdomen sculptured almost like the upper side. Costal vein sharply defined, fuscous; stigma small, dark brown as is also the oblique stigmal vein.

This species is readily distinguishable from others occurring in the Indo-Malayan region by its dark color, infuscated wings, sculpture of head and cheeks, etc. In Kieffer's key (Ann. Soc. sci. Bruxelles, 1908, **32**, p. 124) which is quite complete, it runs near *S. minor* Voll. from Maderia and *S. fulvipes* Först, from Germany.

Cacellus caeruleus, sp. nov.

Type.— M. C. Z. 9,070. Solomons: Santa Cruz, Graciosa Bay. W. M. Mann.

♀. Length 7 mm. Dark metallic blue, legs and antennae entirely black; wings heavily infuscated, the hind ones subhyaline at base, the fore ones dark fuscous anteriorly near the base. Front very deeply and coarsely confluently punctate, with a short median smooth stripe above the base of the antennae; occiput coarsely rugose, temples and cheeks sculptured like the front; malar space short, with a deep furrow; cheeks wide, but temples very narrow; eyes bare, convergent on the front above; ocelli large, in a small equilateral triangle, separated from one another by their own diameter, but almost touching the eye. Mandibles broad, tridentate. Antennae with long, cylindrical scape, nearly as long as the eye-height; first flagellar joint over twice the length of the pedicel and over one third as long as the scape; second flagellar joint wider, twice as long as wide; third wider, quadrate, fifth and following which form the rather slender club transverse, those near the middle of the club twice as wide as long. Thorax and scutellum above very coarsely punctate, the punctures forming longitudinal rugae on the sides of the pronotum and a more or less distinct row just outside the well-marked parapsidal furrows; no median furrow on mesonotum, although there are two short indistinct ridges anteriorly between the parapsidal furrows. Scutellum rounded behind; postscutellum unarmed, visible only as a series of deep foveate punctures under the edge of the scutellum. Propodeum medially raised almost to the level of the scutellum as a triangular portion, pointed behind where it is minutely bidentate; on sides below this smooth, followed by a carina below which the surface is concealed by a rather dense coat of short white hair. Propleurae smooth and polished anteriorly, white, hairy on the posterior strip; mesopleura with a smooth oblique depression, below and anteriorly coarsely strigose, behind with a series of foveae, hairy in front; metapleura rugose-reticulate beneath the hair which is less dense than that on the lower part of the propodeum. Abdomen about half longer than the head and thorax together, with six visible segments; first as long as wide, but little narrowed basally, coarsely longitudinally striate; second and third segments of equal length and similar sculpture, the third quadrate, but the second narrower basally; surface longitudinally striate-reticulate, with series of fine punctures between the reticulations, laterally with a sharp carina which extends also along the sides of the first and fourth segments; medially with a raised line which extends over the fourth segment and indistinctly beyond; fourth segment slightly shorter than the third, quadrate, similarly sculptured; fifth as long as wide, considerably narrowed behind, the lineate sculpture less evident, sixth small, triangular, entirely without lineations but retaining the punctures; all sutures smooth, impunctate; venter coarsely, sparsely punctate, much more convex than the dorsum. Legs rather slender, the tarsal claws simple. Marginal vein rather long, about five or six times as long as thick; stigmal oblique, knobbed, nearly one third longer than the marginal; basals, submedian, and radial veins indicated strongly as dark streaks; cubital and discoidal ones indistinctly so in the same way.

This is a large, beautiful species and should be easily recognized. Although I have not been able to compare it with the type-species of Cacellus it agrees perfectly with the original description of the genus and is congeneric with American species which I refer to Cacellus.

BETHYLIDAE.

APENESIA MALAITENSIS, sp. nov.

Type.— M. C. Z. 9,071. Solomons: Malaita, Auki. W. M. Mann.

♀. Length 4.8 mm. Head, thorax, antennae, and legs pale yellowish brown; abdomen piceous with the apical margins of the basal segments and the sixth and seventh segments entirely fuscous or honey-yellow. Head to apex of clypeus about one fourth longer than wide, slightly narrowed above, with the upper angles obliquely rounded; occipital margin concave; eyes minute, oval, smaller than the pedicel of the antennae, inserted very close to the mandibles; clypeus sharply elevated medially; mandibles bidentate, apical tooth much larger than the inner one. Front and back of head with faint traces of longitudinal aciculations and with a few large scattered punctures. Antennae 13-jointed, barely reaching the vertex; scape thick, obclavate, over half as long as the remainder of the antennae; pedicel globose, as long as the first flagellar joint, second and third flagellar joints each about as long as the first, and somewhat broader; following much broader, transverse; last joint twice as long as the preceding, broadly rounded at tip. Pronotum one half longer than wide, sculptured like the head, rounded in front, truncate behind; neck visible from above, one third as long as the pronotum, rounded in front; pleurae visible from above, appearing one fourth as wide as the pronotum. Middle lobe of mesonotum subtriangular, nearly as long as wide and rounded behind; lateral lobes about twice as long as the median one, the whole mesonotum one half wider than the pronotum, its surface smooth. Propodeum constricted just beyond basal third, a little wider behind than in front; anterior margin concave; apex evenly rounded; upper surface indistinctly longitudinally aciculate, with a few scattered large punctures. Abdomen smooth, as long as the head and thorax together; sparsely clothed with long hairs on the sides, more conspicuously so toward the apex; second segment the longest, quadrate; following growing gradually shorter and narrower. Legs very stout, especially the front femora; middle tibiae strongly, irregularly bispinulose along the posterior surface. Tarsal claws simple.

This species resembles the Papuan *A. proxima* Kieffer in color but differs in the punctate head.

List of Species.[1]

STEPHANIDAE.

Stephanus froggattii Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 357. Antea, p. 98.	Solomon Is.
Stephanus violaceipennis Cam. Proc. Zool. soc. London, 1901, **1**, p. 225.	New Britain.
Parastephanellus maculifrons Cam. Journ. Roy. Asiatic soc. Straits branch, 1902, no. 37, p. 32.	Bismarck Archipelago.
Parastephanellus orbitalis Brues. Antea, p. 98.	Solomon Is.
Diastephanus salomonis Westw. Thesaur. entom. Oxon., 1874, p. 128. Antea, p. 100.	Solomon Is., New Hebrides.

EVANIIDAE.

Gasteruption viridescens Kieff. Berliner entom. zeits., 1906, **51**, p. 273.	New Britain.
Trigonofoenus salomonis Brues. Antea, p. 101.	Solomon Is.
Evania erythrocnemis Schlett. Ann. K.-k. naturh. hofmus. Wien, 1889, **4**, p. 158.	New Britain.
Evania mediana Schlett. Ann. K.-k. naturh. hofmus. Wien, 1889, **4**, p. 157.	New Britain.
Evania muelleri Schlett. Ann. K.-k. naturh. hofmus Wien., 1889, **4**, p. 170.	New Britain.

BRACONIDAE.

Spathius manni Brues. Antea, p. 102.	Solomon Is.
Spathius melleus Brues. Antea, p. 103.	Solomon Is.
Acanthormius dubitatus Brues. Antea, p. 105.	Solomon Is.
Pegarthrum fuscipenne Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 355.	Solomon Is.
Platybracon debilis Brues. Antea, p. 107.	Solomon Is.

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[1] Distribution outside the included area is not cited, see p. 97–98.

Platybracon fortis Brues. Antea, p. 108.	Solomon Is.
Platybracon insularis Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 353. Antea, p. 106.	Solomon Is.
Iphiaulax bignelli Brues. Antea, p. 108.	Solomon Is.
Nedinoschiza cratocephala Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 354.	Solomon Is.
Cratobracon ruficeps Cam. Proc. Zool. soc. London, 1901, **1**, p. 227.	
Bracon (auct.) diores Cam. Proc. Zool. soc. London, 1901, **1**, p. 226.	New Britain.
Bracon (auct.) leucostigmus Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 352.	Solomon Is.
Austroöpius nova guineënsis Szép. Termes. füzetek, 1900, **23**, p. 64. Antea, p. 109.	Solomon Is.
Cardiochiles similis Brues Antea, p. 109.	Solomon Is.
Bracon salomonis Brues. Antea, p. 110.	Solomon Is.
Disophrys fumipennis Smith. Journ. proc. Linn. soc. London. Zool., 1859, **3**, p. 176. Antea, p. 112.	Solomon Is.
Agathis fulgidipennis Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 356.	Solomon Is.
Chelonus salomonis Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 355. Antea, p. 112.	Solomon Is.
Phanerotoma longipes Szép. Termes. füzetek, 1900, **22**, p. 59. (Phanerotomella). Antea, p. 112.	Solomon Is.

ICHNEUMONIDAE.

Eristicus froggattii Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 359.	Solomon Is.
Eristicus salomonis Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 358.	Solomon Is.
Eurycryptus laticeps Cam. Proc. Zool. soc. London, 1901, **1**, p. 232.	New Britain.
Mesostenus insularis Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 360.	Solomon Is.
Xanthocryptus luteus Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 364.	Solomon Is.

Xanthocryptus robustus Cam. Proc. Zool. soc. London, 1901, **1**, p. 233.	New Britain. Solomon Is.
Cyanoxorides splendens Brues. Antea, p. 115.	Solomon Is.
Echthromorpha bitecta Morley. Revis. Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 39.	New Caledonia.
Echthromorpha diversor Morley. Revis. Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 47.	Solomon Is. or New Hebrides.
Echthromorpha equisita Morley Revis. Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 40.	New Caledonia.
Echthromorpha inermis Morley. Revis. Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 46.	New Caledonia.
Echthromorpha insidiator Smith. Proc. Linn. soc. London. Zool., 1863, **7**, p. 9.	New Britain.
Echthromorpha semperi Krieg. Mitt. Zool. mus. Berlin, 1908, p. 329. Antea, p. 113.	Solomon Is., Peleu Is.
Erythropimpla nigra Brues. Antea, p. 112.	Solomon Is.
Erythropimpla pallidiceps Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 362.	Solomon Is.
Exeristes consimilis Morley. Revis. Ichneumonidae British mus. Nat. hist., 1914, pt. 3, p. 27.	New Hebrides.
Lissopimpla erythropus Cam. Proc. Linn. soc. New South Wales, 1911, **36**, p. 363. (rufipes).	Solomon Is.
Lissopimpla pacifica Morley. Revis. Ichneumonidae British mus. Nat. hist., 1913, pt. 2, p. 35.	New Caledonia.
Megarhyssa fulva Cam. (nec Voll.) Proc. Zool. soc. London, 1901, **1**, p. 229. (Rhyssa) (= fasciata Sm.?).	New Britain.
Megarhyssa picea Brues. Antea, p. 114.	Solomon Is.
Megarhyssa tridentata Cam. Proc. Zool. soc. London, 1901, **1**, p. 230. (Rhyssa) (= instigator Sm.?).	New Britain.
Theronia flavistigma Morley. Revis. Ichneumonidae British mus. Nat. hist., 1914, pt. 3, p. 47.	Solomon Is.
Xanthopimpla insularis Cam. Proc. Zool. soc. London, 1901, **1**, p. 231.	New Britain.
Eremotylus longiventris Cam. Proc. Zool. soc. London, 1901, **1**, p. 228.	New Britain.
Enicospilus approximatus Brues. Antea, p. 118.	Solomon Is.
Enicospilus fulacorensis Brues. Antea, p. 117.	Solomon Is.

Enicospilus lunulatus Szép. Bismark Archipelago, Nusa Is.
Ann. Mus. nat. Hungarici, 1906, **4**, p. 143.
Enicospilus malaitensis Brues. Solomon Is.
Antea, p. 117.
Enicospilus nigrinervis Cam. New Britain.
Proc. Zool. soc. London, 1901, **1**, p. 229.
Enicospilus salomonis Cam. Solomon Is.
Proc. Linn. soc. New South Wales, 1911, **36**, p. 361.
Antea, p. 116.
Enicospilus trinotatus Morley.
Revis. Ichneumonidae British mus. Nat. hist., 1912, pt. 1, p. 53.
Australia and possibly Solomon Is. or New Hebrides.
Leptophion longiventris Cam. New Britain.
Proc. Zool. soc. London, 1901, **1**, p. 228.
"Ophion" austrocaledonicus Montr. New Caledonia.
Ann. Soc. Linn. Lyon, 1864, **11**, p. 248.
Paniscus autipodum Vachal. New Caledonia.
Revue. ent., 1907, **26**, p. 120.

LEUCOSPIDAE.

Leucospis antiqua Walker. New Caledonia.
Journ. entom., 1860, **1**, p. 19.
Leucospis gambeyi Maindron. New Caledonia.
Ann. Soc. ent. France, 1878, **8**, p. 164.
Leucospis macrodon Schlett. Solomon Is., New Britain.
Berliner entom. zeitschr., 1890, **35**, p. 168.
Antea, p. 118.

CHALCIDIDAE.

Chalcis cailliaudi Montr. New Caledonia.
Ann. Soc. Linn. Lyon., 1864, **11**, p. 249.
Chalcis euploeae Westw. Solomon Is.
Trans. Entom. soc. London, 1837, **2**, p. vi, Proc.
Antea, p. 121.
Chalcis piraticus Brues. Solomon Is.
Antea, p. 120.
Chalcis salomonis Cam. Solomon Is.
Proc. Linn. soc. New South Wales, 1911, **36**, p. 349.
Antea, p. 121.
Chalcis terribilis Brues. Solomon Is.
Antea, p. 119.

CLEONYMIDAE.

Aressida carinicollis Cam. Solomon Is.
Proc. Linn. soc. New South Wales, 1911, **36**, p. 351.

SCELIONIDAE.

Cacellus caeruleus Brues. Antea, p. 122.	Solomon Is.
Scelio setiger Brues. Antea, p. 121.	Solomon Is.

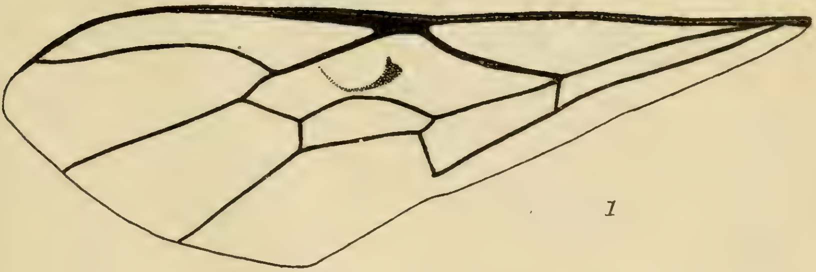
BETHYLIDAE.

Apenesia malaitensis Brues. Antea, p. 124.	Solomon Is.

PLATE 1.

PLATE 1.

Fig. 1. Enicospilus fulacorensis, fore wing.
Fig. 2. Enicospilus malaitensis, fore wing.
Fig. 3. Enicospilus approximatus, fore wing.
Fig. 4. Enicospilus salomonis, fore wing.



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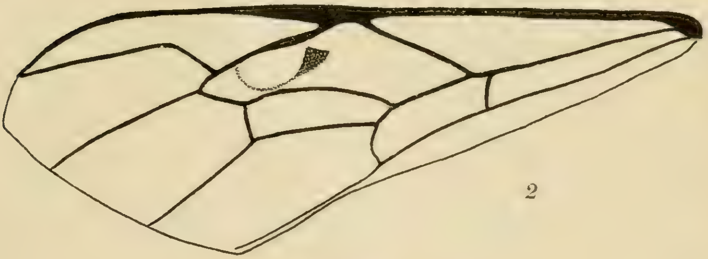

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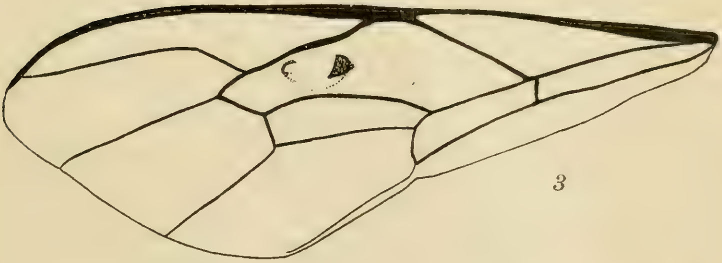

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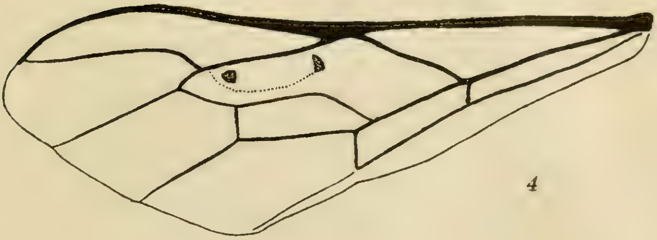

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HELIOTYPE CO. BOSTON

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AT HARVARD COLLEGE.
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FOSSIL MAMMALS FROM CUBA.

By Glover M. Allen.

With One Plate.

CAMBRIDGE, MASS., U. S. A.:
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May, 1918.

No. 4.— *Fossil Mammals from Cuba.*

By Glover M. Allen.

Since the publication in January, 1917, of my paper on new fossil mammals from Cuba (Bull. M. C. Z., **61**, p. 1–12, pl.), the Museum has received a large quantity of subfossil bones from several localities in that island and the Isle of Pines, which so very materially supplement the few fragments on which the original descriptions were based, that it seems desirable to make an additional report on them. The material was collected by Dr. Thomas Barbour, assisted by Messrs. W. Sprague Brooks and Goodwin Warner, from caves in the Sierra de Hato Nuevo, and near Limones, Cuba, as well as from two caves in Sierra de Casas, Isle of Pines. Practically all of the specimens were found loose or only slightly compacted together in the soil-deposit of the caves, hence they are in much better preservation than the fragments originally studied, which had to be carefully chiselled out from a solidified mass. All are of recent origin, some so fresh in appearance that it is hard to believe they have been long in the ground. With the exception of a few skulls fairly well preserved, much of the material is more or less broken and scattered, as though the animals had been torn apart and eaten by owls or land-crabs. In addition to the three species first announced, a new dwarf Capromys was discovered, which has lately been described (Allen, 1917a) on the basis of several lower jaw-fragments, as *C. nana.* Most opportunely a living specimen of this supposedly extinct animal has now been received at the Museum through Dr. Barbour's efforts, so that a complete description of this interesting addition to the present-day fauna of Cuba is made possible.

In addition, I am under obligation to Mr. Gerrit S. Miller, Jr., for the privilege of making a cursory examination of the collection of subfossil bones brought from Cuba by Mr. William Palmer early in 1917, and now in the U. S. National Museum; also to Mr. H. E. Anthony of the American Museum of Natural History, for the opportunity of studying similar specimens collected by him in eastern Cuba. A brief report by Peterson (1917) has since appeared on cave-fossils from the Isle of Pines found in 1913 by the Messrs. Link. Curiously, no additional species have been recognized among the large number of fragments now obtained.

NESOPHONTES MICRUS G. M. Allen.

Plate **1**, fig. 7–10.

Nesophontes micrus G. M. Allen, Bull. M. C. Z., 1917, **61**, p. 5, pl., fig. 14.

The only specimen previously available was the type, a fragment of the right lower jaw, containing a part of pm_4, m_1, m_2, and the roots of m_3. It was referred to Nesophontes with some doubt, but the large number of specimens now at hand proves that it was correctly assigned to that genus. In addition to several nearly complete crania and lower jaws, sundry limb-bones, chiefly femora, were also collected, so that a detailed comparison may now be made between this and the Porto Rican species, *N. edithae* Anthony. As in that species, the specimens fall into two series, a larger and a smaller, which as Anthony (1916) has suggested, probably represent males and females respectively. The differences are slight but constant, and can hardly mean anything else, though it is unusual among the Insectivora to find sexual dimorphism in size. The skulls assumed to be those of males have the rostrum broader and stouter, less tapering, with slightly broader palates and parallel instead of convergent tooth-rows; they are slightly larger also in general dimensions. Anthony's description of the skull of *N. edithae* applies in general to *N. micrus*. In one specimen of the latter, the pterygoids are intact and are seen to project ventrally below the level of the palate for about a millimeter, then curve posteriorly to end each in a delicate bony hook. The teeth seem essentially alike in both species, though in none of the skulls of the Cuban animal are the three incisors present. The double-rooted canine (Plate **1**, fig. 9) is relatively large, with a deep groove on its anterior face, two similar grooves delimiting a median ridge on the inner face of the tooth, and a slight cingulum on the postero-external half. Anthony states that the paracone is absent in the molars of Nesophontes, but this is not the case except in much worn specimens. Those with unworn molars exhibit the typical W-pattern, except that the paracone is much reduced in size, hardly one fourth as large as the metacone. The hypocone is represented by a cingulum-like ledge. As previously pointed out, the third lower molar in *N. micrus* is relatively smaller than in *N. edithae;* the second lower premolar is also much smaller than the first, instead of being nearly the same size. In lower jaws presumed to be of females the ramus is much the more slender, while in those assumed to represent the males, it is larger and more heavily proportioned with a greater downward curvature of the lower border of the ramus.

The following measurements illustrate the sexual difference in size of the skull: —

	♂9954	♂9907	♀9953	♀9890
Least interorbital width	7.2		6.2	
Width outside alveoli of canines	5.0		4.0	
Width outside last upper molars	9.2		7.8	
Length from canine to glenoid fossa	17.0		16.0	
Tooth-row, canine to back of m^3 (alveoli)	11.4		11.0	
“ “ upper molars	5.8		5.3	
Jaw, greatest depth of ramus		3.8		3.0
“ “ “ through coronoid		8.1		8.0
Tooth-row, c–m_3 (alveoli)		12.2		11.8

While agreeing with Anthony (1916) that the characters distinguishing this genus from other insectivores with which sufficient comparison can be made, are enough to give it rank as the representative of a separate family, I am unable to share his view that they ally it "more closely to the Soricidae than to other families." The fundamental resemblances to the zalambdodonts seem more striking. It is natural to make comparison with Solenodon, the other insectivorous genus that has been contemporary in the Greater Antilles with Nesophontes. The general points of likeness are obvious: — the shape of the skull, the incomplete zygomatic arch, the long tubular rostrum, early fusion of the nasals (also in Soricidae), the slight inflation of the frontal region, large foramen magnum, prominent lambdoid, and low sagittal crests, the tooth-formula, the double-rooted upper canine, and the transversely expanded mandibular condyle. One specimen of Nesophontes has preserved the petrous bone of the ear, though the tympanic, which therefore is separate, has gone. The petrosum is very similar in general topography to that of Solenodon. On the other hand Nesophontes does not show the specialization of incisors nor the reduction of the canines, so marked in Solenodon. The latter, however, is rather an extreme type in this respect as compared with Microgale or Oryzoryctes, in which the canine is little reduced and the incisors have merely an additional posterobasal cusp. The milk incisors of Solenodon are small unspecialized teeth, the first pair in no way resembling their enormous permanent successors. A comparison of the upper molars is of great interest. In Solenodon as in other zalambdodonts — Centetes, Potamogale, Microgale, etc.— the cusp-development seems to result in the formation of a single V instead of the more primitive W-pattern. The generally accepted view is that the main cusp represents a fused paracone and metacone in which the latter is the obliterated element. In Solenodon two small internal cusps are interpreted as protocone and hypocone, the large median cone as the fused paracone and metacone. Another view may be put forward, however; namely, that the main cusp in the Solenodon molar is the metacone, and that the paracone is represented by a small style-like eminence anteriorly at the outer rim. At all events it is frequent in the Chiroptera to find the paracone much smaller than the metacone, while protocone and hypocone are small, at the inner edge of the tooth. The point of interest is that the upper molars of Nesophontes offer a similar intermediate condition between the fully developed W-pattern of cones and the V-pattern of Solenodon and perhaps other zalambdodonts. For although Anthony states that the molars of Nesophontes have the "V-shaped metacone only, instead of both metacone and paracone," it seems clear that this appearance must have been due to wear in the specimens he studied. Most of our series of crania of *N. micrus* from Cuba are in a similar condition, but one nearly perfect specimen has the teeth unworn. These show that the first and second molars have a large protocone forming the main cusp of each tooth, with a low cingulum-like ridge representing the hypocone. A small paracone is clearly developed, about one fourth the area of the metacone. With wear, the former disappears; yet its outlines seem traceable even in Anthony's figure (Fig. 3) of the palatal view of *N. edithae*. A further reduction in the size of the paracone and protocone, with corresponding enlargement of the metacone, would easily give rise to the type of molar seen in Solenodon. It is not so obvious that this method of derivation would apply equally to the Old World zalambdodonts, but it seems fairly apparent in these two genera of the New World. If this view be accepted, Nesophontes may represent a stage in molar-development ancestral to that of Solenodon, in which the prominent features of the skull and limbs are similar, but the teeth are much more primitive, a stage perhaps in some degree intermediate between the zalambdodonts and the soricoids, though distinctly nearer the former.

The humerus is almost a miniature of that of Solenodon, but more slender, with globose head, strongly marked bicipital groove and deltoid ridge, the last so elevated as to accentuate considerably the compressed form of the shaft. At the distal end, the humerus is expanded, and has an entepicondylar foramen, as well as a large supratrochlear perforation, which when present in Solenodon, is small. Two small radii that are presumably referable to Nesophontes, differ markedly from that of Solenodon in being much less flattened, and not unusually broadened at the distal end. The femur, except for its proportionally greater length and slenderness, is the counterpart of that of Solenodon.

Measurements.— A nearly perfect cranium, probably that of a female, 9,953 M. C. Z., measures as follows: — greatest length 28 mm.; basal length 25; palatal length 13.4; interorbital width 6.5; width of brain-case 11.2; upper tooth-row (alveoli) 12.8; lower jaw, ♂ (9,898 M. C. Z.), greatest length exclusive of incisors 18.5; tooth-row, from front of canine to back of last molar 12. Humerus, greatest length (9,914 M. C. Z.) 14.7 (of *N. edithae* 25); radius (9,947 M. C. Z.) 14.5; femur, ♂ (9,915 M. C. Z.) 21.5; ♀ (9,958 M. C. Z.) 16 (of *N. edithae* 26.5).

Mr. H. E. Anthony has kindly placed at my disposal a fine skull of this species, which he collected with others, in a cave at the eastern end of Cuba. It appears to differ in no way from the specimens in the Museum from the western end of the island. A single humerus from a cave in the Sierra de Casas, Isle of Pines, as well as Peterson's (1917, p. 360) recent announcement of the discovery of a poorly preserved skull and ramus establishes the former occurrence of the species on that island as well. The evidence at hand indicates that until a comparatively late date the species was common in Cuba and the Isle of Pines; that it was a primitive type, unmodified either for arboreal or fossorial life, hence probably of shrew-like terrestrial habits. While probably related to the Solenodon stock, its teeth appear to be of a more primitive style and represent what may have been a stage ancestral to the Solenodon molar, in which the paracone was becoming suppressed in favor of the metacone. So fresh is the appearance of some of the jaws obtained, that it would come as no surprise to discover that Nesophontes still exists alive in some isolated part of Cuba.

It is odd that no remains of the Solenodon have come to light in any of the cave-material collected, except at Maisi, where Señor V. J. Rodriguez obtained two lower rami, one of which has been presented to the Museum by Professor Carlos de la Torre. These seem in fresh condition, except for a slight reddish discoloration.

Boromys torrei G. M. Allen.

Plate **1**, fig. 11–13.

Boromys torrei G. M. Allen, Bull. M. C. Z., 1917, **61**, p. 6, pl., fig. 10–13.

Boromys was founded by Miller (1916) on the anterior half of a skull excavated in the ancient Indian village-site at Maisi, Baracoa, Cuba, and named *Boromys offella.* The fragments from Sierra de Hato Nuevo which I described as *Boromys torrei*, a much smaller species, included but two upper teeth with palate, and all but the last molar of the lower jaw. The later collections of Messrs. Barbour, Brooks, and Warner include numerous jaws of both animals, and a very fine cranium (Plate **1**, fig. 11–13), lacking the incisors, of *B. torrei.* This discovery enables a clearer determination of the characters of the species. The skull is evidently adult, though not aged, since the basioccipital suture is still unclosed. All the teeth are well worn down so that the posterior molar alone retains the enamel lakes left by the wearing away of the secondary re-entrant folds. That this smaller species is really a Boromys and not referable to the Santo Domingan Brotomys is proved by the presence of the supplementary groove at the inner lower corner of the large antorbital foramen, and the pronounced swelling on the inner wall of this part of the maxillary, caused by the root of the upper incisor. The general structure of the skull is much like that of Capromys, but the dorsal profile is more rounded. As in that genus, the parietals and interparietals have fused into a solid plate while the frontals still retain their boundaries distinct. The nasals are lost, but seem to have bowed outwardly at the sides, and to have ended proximally on a level with the ends of the ascending premaxillary branches. The rostrum is short. The incisive foramina open into a broadly excavated pit, the outlines of which are carried back as raised ridges to the inner corner of the first molariform teeth. The small cylindrical cheek-teeth are in two parallel rows, their grinding surfaces bevelled slightly outward. The anterior three have worn down below the level of the secondary re-entrant folds of enamel, so that their pattern is that of a figure 8, with the inner re-entrant very slightly in advance of the outer. The last molar is less worn, and contains in the anterior half of its crown, a transversely oval enamel-lake, and in the posterior half a much smaller circular one. The postpalatal portion of the skull comprises about one half its total length. The striking feature is the great proportionate size of the audital bullae, the length of which is a third the basal length of the skull. As in Capromys, the mastoid and styloid processes are slender but well developed, though damaged in the specimen. Among the many fragments of crania and lower jaws are two rami containing all the teeth, and so supplying the characters of the last lower molar, which, in my previous paper, I was unable to give. As there shown, it is the premolar only that has a secondary re-entrant loop of enamel in the anterior half of the crown. In all three lower molars, the enamel-pattern is essentially similar, and consists of an outer and an inner median fold, the tip of the former ending slightly behind that of the latter; in the posterior half of the crown is a secondary shallower re-entrant from the inner side, that becomes cut off by wear to form a small round enamel-lake, and then by further wear disappears altogether. In *Boromys torrei*, the last lower molar differs from the two preceding in its reduced crown-area and in the proportionally greater length of the main inner re-entrant, which extends nearly to the opposite side of the tooth. The general character of the tooth-pattern shows much resemblance to that of the less specialized types of spiny-rats (Echimys) and even to that of Thryonomys. The form of the skull, however, is very different in its short rostrum, weak teeth, large bullae and full, rounded brain-case, suggestive of a tree-living animal.

The skull measures: — greatest length 42.5 mm.; basal length 33.4; palatal length 17; diastema 9.5; zygomatic width 23; mastoid width 18.5; least interorbital width 11; upper cheek-teeth (crowns) 7.2; lower cheek-teeth (crowns) 7; lower diastema 5.

Sundry associated limb-bones are taken to be those of this species, and indicate a relatively short-legged animal with separate tibia and fibula as in Echimys, Capromys, Thryonomys.

In addition to the series of specimens from Sierra de Hato Nuevo, Messrs. W. S. Brooks and Goodwin Warner obtained this species also in recent cave-deposits from Sierra de Casas, Isle of Pines, indicating that its distribution formerly included that island as well. Peterson (1917) has lately published the finding of five "skulls and portions of skulls" in a cave on this island by the Messrs. Link in 1913.

BOROMYS OFFELLA Miller.

Plate 1, fig. 6.

Boromys offella Miller, Smithsonian misc. coll., 1916, **66**, no. 12, p. 8.

This larger species of Boromys was based on the anterior half of a cranium from the Indian village-site at Maisi, Baracoa, Cuba. The collections made by Messrs. Barbour, Brooks, and Warner, include maxillae and a fine series of lower jaws from the caves not only at Limones, Cuba, but from those of the Sierra de Casas, Isle of Pines, as well. Except for greater size, I am unable to find any real difference in the teeth and jaws of the two species. The young of *B. offella*, in which the last molar is unerupted, have a tooth-row as long as that of adult *B. torrei* with all four teeth. The crown-area in adults of the former is about thrice that of the latter. The cheek-teeth begin to wear at an early age. One specimen (9,935 M. C. Z.) has pm_4 and m_1 only in place, with an unworn m_2 just emerging, but already the premolar is so worn that the secondary enamel-folds are reduced to small, round lakes. The posterior of these is first to disappear, and in old animals the main re-entrants are also reduced to ellipses in the anterior teeth (Plate **1**, fig. 6) before the secondary folds are quite gone from the posterior pair. The incisors are bright orange on their anterior face. The jaw is of the typical octodont form, but the coronoid process is small, the condylar process low and rounded, the angulare long and tapering, surpassing the condyle in backward extent.

The adult specimens give the following measurements: — upper cheek teeth (alveoli) 11.5 mm.; three anterior cheek teeth (crowns) 9; lower cheek teeth (alveoli) 11.5; (crowns) 10.8; lower diastema 9.4; greatest length from condyle of jaw to base of incisor above 37; greatest length from angular process to same point 42; depth of jaw at condyle 17.

The presence of two closely related species of Boromys in Cuba and Isle of Pines has an interesting parallel in the two (or more) species of Capromys, as well as of crows, among birds. No doubt there were some further differences in structure and habit that do not appear from the fragments at hand.

Capromys nana G. M. Allen.

Plate **1**, fig. 1–5.

Capromys nana G. M. Allen, Proc. N. E. zool. club, 1917, **6**, p. 54.

This small species I described lately on the basis of jaw-fragments found in a subfossil condition in cave-deposits at two localities in Cuba, near Limones and in the Sierra de Hato Nuevo. These were collected by Dr. Thomas Barbour during his stay in that island early in 1917, and were associated with remains of Nesophontes, Boromys, and Geocapromys. It was supposed that the species must have become extinct since the introduction of house-rats by Europeans, for, being of nearly the same size as a rat, it would soon come into competition with them. While in central Cuba, Dr. Barbour made many inquiries among the country people with a view to eliciting possible information as to the supposedly extinct mammals, and finally learned through Señor Lucas Ramos of a very small rat-like species, not a house-rat, that was seen rarely. Through the interest of this gentleman and of Señor Don José Garcia, one of these animals was finally captured and sent by Señor Garcia to the Museum, preserved in alcohol. It is of very great interest to find that it is *Capromys nana*, proving that this fourth species of the genus is yet extant in Cuba. According to Señores Ramos and Garcia, live individuals have been seen on a few occasions, as when saw-grass has been fired to improve grazing, thus forcing them to rush off to places of safety. No doubt its range was formerly much more extensive as shown by the presence of its remains in at least two separate localities in western Cuba.

The skin of this alcoholic specimen has been very handsomely prepared by Mr. George Nelson. The animal is an adult female, of about the size of a large Norway Rat, and a typical Capromys, nearest resembling in general appearance *C. prehensilis*, though with a tail distinctly bicolored, dark above and light below except at the tip which is black all around. The upper surface of the head, body, and forearms is a mixture of long black hairs with hairs having an ochraceous tip, except that on the muzzle and in front of the ear these parti-colored hairs have whitish tips instead. The fingers and sides of the feet are whitish, but the middle of the metacarpal and metatarsal regions is darkened. On the rump the ochraceous tips of the hairs become longer and deeper colored, and extend on to the base of the tail for nearly three quarters of an inch. Beyond this point, the character of the hair changes, becoming shorter, less coarse, and (particularly on the lower side) slightly recurved, so as to give a somewhat bushy appearance. The scaly surface of the tail is faintly visible through its covering. The dorsal side of the tail is black, as well as the terminal inch of the lower surface, but elsewhere is pale ochraceous buff, rather sharply marked off. The throat and sides of the belly are like the back, but paler and with less admixture of black hairs; the chin, middle of belly, and inner sides of the legs grayish or dull white. The vibrissae are deep black; the ears nearly naked but sparsely covered with short black hairs.

The mammae are two on each side, as in other members of the genus, one pair pectoral, one abdominal, situated well up on the sides. The naked soles of both fore and hind feet are granulated, but like those of *C. prehensilis,* have three larger pad-like areas on the palms, with on the fore feet, two additional ones nearer the carpus.

The measurements in the flesh are: — total length 395 mm.; tail 176; hind foot with claws, 45 long, by 14 in greatest width of palm; ear from meatus 19, its greatest transverse width 14.5.

The viscera were somewhat macerated, but in so far as could be ascertained, seemed to differ in no important way from the soft parts of *C. melanurus* as described by Dobson (1884). The coecum seemed relatively larger, about the length of the body-cavity, and distinctly sacculated (about 115 mm. long). The body-cavity posterior to the diaphragm is large to accommodate the intestinal mass. The large ovoid kidneys are conspicuous, and as in *C. pilorides* have an elongate oval adrenal body close to the anterior end of each. The liver is like that of *C. melanurus* except that it appears to lack the small secondary lobe at the base of the main anterior lobe of the left side. This lobe is present in both *C. melanurus* and *C. pilorides.* As first described by Say (1822), the liver in the latter species is remarkable on account of its being minutely divided into separate glandular masses closely appressed, so that exteriorly the main lobes have a reticulate appearance. This character, so evident in *C. pilorides,* is quite absent in the livers of *C. melanurus, C. prehensilis,* and *C. nana,* which present the usual solid structure. The small thoracic cavity is bounded posteriorly by the diaphragm which reaches ventrally the 10th rib, and dorsally extends back as far as the 12th. The lungs agree in their general form with those of *C. melanurus* and *C. pilorides* as described by Owen (1832).

In the characters of the skull, *C. nana* is in several ways the most primitive of the genus, with certain striking resemblances to the spiny-rats (Echimyinae). Thus the brain-case is much less prolonged and rounder in profile than in any of the other species. The orbit is very large for the genus, larger than the antorbital foramen, with a lighter zygomatic arch, in decided contrast to adults of the other species, in which the height of this foramen equals (*C. prehensilis* and *C. melanurus*) or exceeds (*C. pilorides* and Geocapromys (the vertical diameter of the orbit. A third point of resemblance to the spiny-rats is in the narrow ledge or beading overhanging the orbit and temporal fossa as far back as to include the upper edge of the squamosal process. That these characters are primitive is indicated by the fact that in a young skull of *C. prehensilis* having but three molariform teeth, they are nearly as apparent, though the skull is already somewhat produced behind, the orbit is only slightly higher than the antorbital foramen, and the supraorbital ledge shows a distinct process. The incisors are white in the young *C. prehensilis* as in adult *C. nana,* but in adults of both *C. prehensilis* and *C. melanurus* are yellow. A distinctive feature of the palate in *C. nana* is the knife-like median bony ridge, terminating in a slight projection at the posterior border. The teeth are hardly to be distinguished except for their small size, from those of *C. prehensilis.*

Except for the brief account by Chapman (1901, p. 320) no comparisons seem to have been made between *C. prehensilis* and *C. melanurus.* The series of both species in the Museum, shows that the skulls of the two are very similar, and differ chiefly in that *C. melanurus* has slightly more inflated frontals, with less developed post-orbital processes. On the inferior side of the skull, the noteworthy difference lies in the narrower basioccipital and basisphenoid of the latter species. So greatly does *C. melanurus* resemble *C. prehensilis* in its general characters that it seems reasonable to consider it an offshoot from the latter, that under the slightly different conditions at the eastern end of Cuba, and with perhaps slightly more squirrel-like habits, has developed here since the isolation of Cuba from the mainland. The tail is apparently not used as a prehensile organ in the way characteristic of *C. prehensilis,* for the hairs are longer and unworn in the series studied, in contrast to the short-haired tails of *C. prehensilis* in which the hair is often much more worn away on one side than on the other. The color of the tail in *C. melanurus* varies from black to deep maroon or rusty.

Correlated with the difference in use of the tail, is its greater bushiness in *C. melanurus,* as well as its tendency to break off easily near the base, a peculiarity it shares with the Echimyinae. Dr. Barbour, who is familiar with both *C. prehensilis* and *C. melanurus* in life, says that the hunters are always careful not to seize a wounded *C. melanurus* by the tail, well knowing how easily that member parts and allows the animal to escape, whereas with *C. prehensilis* no such precaution is taken. As with the spiny-rats, the place where the tail breaks easiest is near the base, where the character of the hair changes sharply from the shaggy pelage of the body to the shorter covering of the tail. The loss of this appendage seems to cause no particular discomfort to the animal. It comes away easily, without bleeding, leaving a rosette of frayed muscle-fibers at the stump, just as with a lizard's tail when broken.

Following are measurements of the skull and other bones of *C. nana*. Skull: — greatest length 51 mm.; basal length 45.5; palatal length 26.4; diastema 13.7; nasals 15; zygomatic width 28; mastoid width, 20; least interorbital width 11.7; width outside last upper molar 9; audital bulla 12 × 8.6; vertical diameter of orbit 11.8; of antorbital foramen 9.5; length of upper tooth-row 11; of lower tooth-row 11.2. Length of humerus 32.7; radius 29.5; ulna 36.7; femur 39; tibia 40.5; fibula 36; pelvis 45.5.

The number of vertebrae in the four species of the genus, and in a specimen of Geocapromys, was found to be as follows:—

	Cervicals	*Dorsals*	*Lumbars*	*Sacrals*	*Caudals*
C. pilorides	7	16	7	4	21 = 55
C. prehensilis	7	18	6	4	28 = 63
C. melanurus	7	17	7	4	28 = 63
C. nana	7	16	6	4	28 = 61
G. thoracatus	7	15	6	4	17 = 49

The agreement in total number of vertebrae between *C. prehensilis* and *C. melanurus* is probably evidence of their close relationship. In the only two skeletons examined, that of the former had one more dorsal but one less lumbar than that of the latter. In *C. nana*, the number of ribs is slightly reduced — sixteen — and there are but six lumbars. Geocapromys has the fewest ribs — fifteen. The tail-vertebrae are 28 in *C. prehensilis, C. melanurus,* and *C. nana,* but are more reduced in *C. pilorides* (with 21) and Geocapromys with only seventeen.

The structure of the sternum is essentially similar in all four species. In *C. pilorides,* there are in addition to manubrium and xiphisternum, six other sternebra. In a ventral view, the adult sternum shows the fifth and sixth practically fused, though the line of fusion is distinctly marked. The seventh sternebrum is visible in a dorsal view only, as a very short nodule of bone, lying above the posterior end of the fifth. It offers attachment to the cartilaginous portions of the seventh pair of ribs. The xiphisternum adjoins this segment and consequently lies dorsal to the plane of the others. The cartilaginous parts of the eighth pair of ribs alone unite with its anterior end. The conditions in *C. prehensilis* seem to be nearly similar, except that in the single young specimen available, the fifth and sixth sternebra had not yet united, and the seventh sternebrum is extremely small, a minute nodule. The cartilaginous tips of the eighth and ninth ribs both adjoin the anterior end of the xiphisternum. The sternum of *C. melanurus* is apparently similar, except that no trace of the small seventh sternebrum was found in the single skeleton examined. The sternum of *C. nana* differs only in that the small seventh segment has fused with the xiphisternum. The ends of the seventh and eighth pairs of ribs are attached at this point. The manubrium is transversely lozenge-shaped with a relatively long narrow stem, different from the short stem of *C. prehensilis* and *C. melanurus*. The xiphisternum also is slender as in *C. pilorides*.

In other details of the skeleton, *C. nana* resembles the three other species of the genus. The clavicles are well developed, the tibia and fibula are separate, and the femur has the straight outer border, rather characteristic of many octodonts, without the prominent external trochanteric ridge, seen for example in the house-rats (Epimys). The species is probably altogether, the most generalized of the genus.

GEOCAPROMYS COLUMBIANUS (Chapman).

Capromys columbianus Chapman, Bull. Amer. mus. nat. hist., 1892, **4**, p. 314, fig. 3, 4.

Synodontomys columbianus G. M. Allen, Bull. M. C. Z., 1917, **61**, p. 5.

Geocapromys cubanus G. M. Allen, Bull. M. C. Z., 1917, **61**, p. 9, pl., fig. 7–9.

The wealth of excellent specimens received since my study of the fragments described as *Geocapromys cubanus*, shows not only that the latter represented young or smallish animals, but also that they are undoubtedly the same species as Chapman's *Capromys columbianus* described from Cuban cave-fossils. The approximation of the tooth-rows appears to increase slightly with age, but though considerable, does not amount to actual contact as had seemed to be indicated by the figures of the type and by the specimen itself, which is slightly broken at the front end of the palate. The Cuban Geocapromys proves to have been an animal quite as large as the Jamaican *G. browni* if not a trifle larger, hence considerably larger than *G. thoracatus* and *G. ingrahami*. The palate offers several differential characters. Its median bony ridge ends abruptly at the palatal margin in *G. browni;* in *G. thoracatus* it continues as a short median projection at that point; but in both *G. ingrahami* and *G. columbianus* it fades out before reaching the palatal margin. In the last species also, the opening of the posterior nares is much the most narrowed and the terminal wings of the palatals are correspondingly broadened behind the palatal margin. The molar alveoli are more or less square in outline, and the re-entrant enamel-folds of the teeth are noticeably more nearly at right angles to the axis of the tooth-row than in the large *Capromys pilorides,* remains of which are found associated in the same caves. Another feature that comes out in comparison of the jaws of this and the last-named species, is that in Geocapromys the posterior face of the last lower molar is nearly straight across instead of at a decided angle to the long axis of the tooth-row. This character is useful to identify toothless jaws, since the shape of the alveoli is thus quite different; frequently too, the presence of the additional internal bony ridge in the alveolus of the premolar can be made out.

While the Cuban Geocapromys is intermediate in certain palatal characters between *G. ingrahami* and *G. browni,* I have been unable to find any points of difference between fragments from the Cuban caves and those from caves in Sierra de Casas, Isle of Pines, where Dr. Barbour's party obtained a series. This is the more interesting, since both species of Capromys from the latter island differ slightly from their Cuban representatives.

In a single skull in which the premaxillary is preserved, its ascending process is less broadened proximally than in *G. browni* and *G. ingrahami,* and is thus more like that of *G. thoracatus.*

The alveolar length of the maxillary tooth-row in a full grown specimen is 21 mm.; of the mandibular row 19 mm.

REMARKS.

The preliminary exploration of the Cuban cavern-deposits, as carried out by Dr. Barbour and his associates, as well as by Mr. H. E. Anthony of New York, and Mr. William Palmer of Washington, has thus far revealed nothing really comparable with the fossil or subfossil mammals from the Porto Rican caves, with two exceptions. These are the insectivore Nesophontes, of which a small representative is found in Cuba, and a larger one in Porto Rico; and the small ground-sloth, Acratocnus of Porto Rico, which is represented in Cuba by a closely allied if not identical genus. For the rest, the three Cuban species of Capromys find no strict counterparts elsewhere, though Geocapromys is represented on Jamaica, Swan Island, and Plana Keys. The Porto Rican Isolobodon is nearly allied to Capromys and to the Santo Domingan Plagiodontia, but its origin is doubtful. In Porto Rico Mr. J. L. Peters and I found its remains either in Indian shell-heaps or altogether superficially — actually exposed on the surface — in caves. This may indicate that it was kept for food by the natives and carried from one island to another, for neither Dr. Boaz, nor Mr. Peters and myself found its bones in deeper excavations that produced the ground sloth, Acratocnus, Heteropsomys, Heptaxodon, or Elasmodontomys. The complete identity of Isolobodon remains from Santo Domingo with those from Porto Rico, as shown by Miller, is further indication of some such equalizing factor. Nothing corresponding to Boromys has been discovered in Porto Rico, though Brotomys of Santo Domingo is probably related. Of other Porto Rican genera, Elasmodontomys, Heteropsomys, Homopsomys, and Heptaxodon, nothing has as yet appeared in the islands to the west.

Contrary, then, to what one might perhaps expect, the present evidence shows that Porto Rico, the Greater Antillean island most distant from the North American continent but nearest the South American end of the chain, contained the most varied fauna of terrestrial mammals as well as the largest forms (except for Megalochnus). For Elasmodontomys was bigger than the common porcupine, Heteropsomys was as large as an agouti; while Amblyrhiza, of Anguilla, was nearly the size of a paca. These facts suggest that the land-mammals of Cuba are farther distant than those of Porto Rico from some center of distribution and reached there, not by way of Central America, but from South America by way of the supposed former land-mass of which the Lesser Antilles now form the remnant. The fact that Procapromys the nearest living continental relative of Geocapromys and Capromys, is to be found so far as yet known, only in the mountains of Venezuela, between La Guayra and Caracas, possibly points in the same direction. Further exploration alone, however, may hope to solve the matter.

The comparison with Santo Domingo merely accentuates the known peculiarity of its fauna, for with the exception of Solenodon, generically identical with the Cuban form, its few other genera hitherto known are not seen on the other islands, namely, Brotomys, Plagiodontia, and (if it be endemic there) Isolobodon.

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EXPLANATION OF THE PLATE.

EXPLANATION OF THE PLATE.

Fig. 1–5, *Capromys nana.*

Fig. 1. Cranium from below. 17,361 M. C: Z. × 1.
Fig. 2. Same in profile. × 1.
Fig. 3. Same from above. × 1.
Fig. 4. Exterior view of right ramus. × 1.
Fig. 5. Crown view of type ramus. 9,864 M. C. Z. × 2.

Fig. 6, *Boromys offella.*

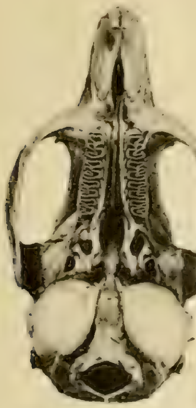
Fig. 6. Left lower ramus, showing much worn crowns of molars 1 and 2. 9,916 M. C. Z. × 2

Fig. 7–10, *Nesophontes micrus.*

Fig. 7. Left ramus in profile, showing canine, premolars and molars. × 2.
Fig. 8. Cranium from below, female. 9,953 M. C. Z. × 1.
Fig. 9. Rostrum in profile, showing double-rooted canine. 9,892 M. C. Z. × 2.
Fig. 10. Cranium from above, female. 9,953 M. C. Z. × 1.

Fig. 11–13, *Boromys torrei.*

Fig. 11. Cranium from below. 9,926 M. C. Z. × 1.
Fig. 12. Same in profile. × 1
Fig. 13. Same from above. × 1.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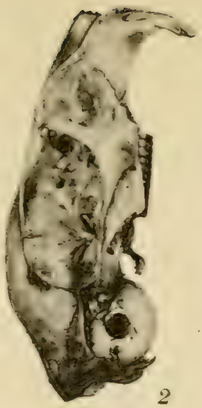
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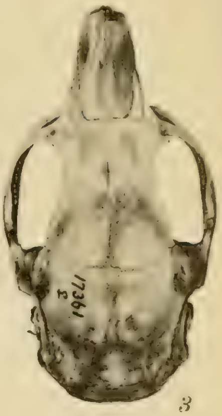

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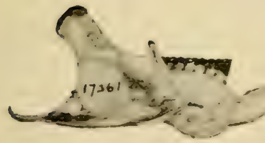

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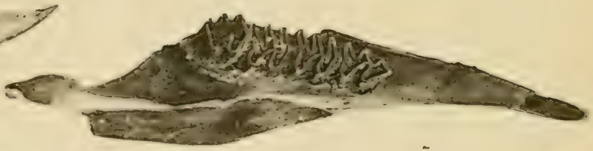
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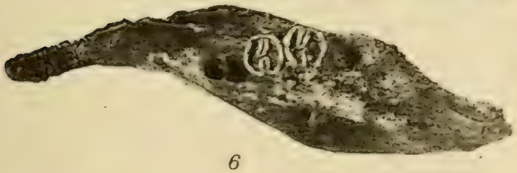
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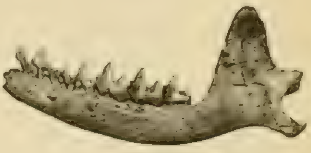
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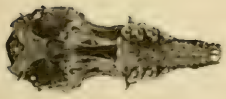
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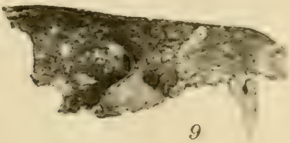
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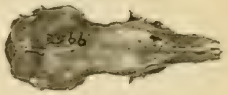

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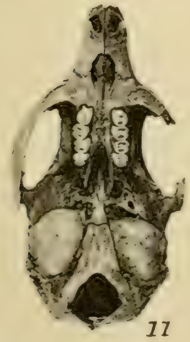
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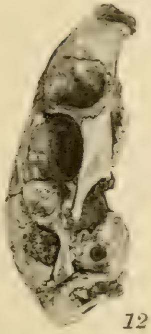
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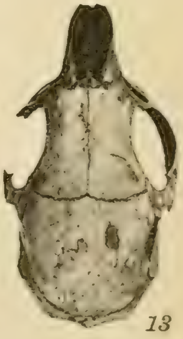
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HELIOTYPE CO. BOSTON

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THE CHILOPODA AND DIPLOPODA OF THE WEST INDIES.

BY RALPH V. CHAMBERLIN.

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No. 5.— *The Chilopoda and Diplopoda of the West Indies.*

By Ralph V. Chamberlin.

Inasmuch as the present paper is preliminary to a more extended monograph on the West Indian myriopod fauna, it has seemed inadvisable to introduce any discussion of the problems of the distribution and origin. For the same reason, only preliminary diagnoses of the many new forms are given and illustrations of these are omitted. In addition to the fauna of the more strictly West Indian islands tabulated (p. 251–262) the forms known from Tobago, Trinidad, and Swan Island are also considered in the text.

CHILOPODA.

Cryptopidae.

1. Cryptops bivittatus Pocock.

Journ. Linn. soc. London, 1893, **24**, p. 462.[1]

Habitat.— St. Vincent.[1]

2. Cryptops manni Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 501.

Habitat.— Haiti: Milot (W. M. Mann).

3. Cryptops cornifer, sp. nov.

Type.— M. C. Z. 2,094. *Paratype.*— M. C. Z. 2,095. Cuba: Trinidad, Loma del Marín. T. Barbour, W. S. Brooks.

Cephalic plate with paired sulci over entire length as in the Australian *C. haasei* Attems. First dorsal plate with transverse, evenly curved, semicircular sulcus; paired longitudinal sulci parallel forward to transverse sulcus. Prosternal margin doubly convexly bowed; bristles 6 + 6 or 7 + 7. Anterior tarsi not distinctly divided. Most ventral plates with well-marked longitudinal sulcus in addition to the deeper, curved transverse one. Last ventral plate with sides distinctly converging caudad, trapeziform; caudal margin at middle slightly incurved. Coxopleurae not at all produced caudally, pores rather numerous. Prefemur of anal legs armed below and laterally with numerous long slender spines or spiniform setae, but with a median longitudinal area on ventral surface free from them; this area wider caudally than anteriorly and bearing a few long fine hairs; at the distal end of the prefemur above and on the mesal side there is a long, stout, acute spine curving caudad distally. Femur on ectal side of distal end above with a similar single large curved spine and the tibia with a similar spine and in addition one on the mesal side. Tibia ventrally with a series of ten teeth, and the first tarsal joint with three. Length 23 mm.

4. OTOCRYPTOPS FERRUGINEUS (Linné).

Scolopendra ferruginea Linné, Syst. nat., ed. 12, 1767, **1**, pt. 2, p. 1063.

Scolopocryptops miersii Meinert (non Newport), Proc. Amer. philos. soc., 1886, **23**, p. 181.[1]

Scolopocryptops ferrugineus Pocock, Journ. Linn. soc. London, 1893, **24**, p. 463.[2]

Habitat.— NEW PROVIDENCE: Nassau (G. M. Allen, T. Barbour, O. Bryant). CUBA[2]: Guantanamo (C. T. Ramsden), Los Hondones (C. T. Ramsden), Bolondron (W. M. Wheeler), Soledad, near Cienfuegos (T. Barbour). ISLE OF PINES: Sierra de Casas, La Ceiba (T. Barbour, W. S. Brooks). JAMAICA:[2] Mandeville (T. Barbour), Liguanea Plain (C. T. Brues), Blue Mt. Cinchona (C. T. Brues), Port Antonio (A. E. Wight), Kingston [1] (S. Garman, T. Barbour). HAITI: Grand Anse (Uhler),[1] Jeremie[1] (D. F. Wienland), Diquini, Port au Prince, Petionville (W. M. Mann). GUADELOUPE: Soufriere (G. K. Noble). DOMINICA (G. A. Ramage[2]). MARTINIQUE (S. Garman). ST. VINCENT (H. H. Smith).[2] GRENADA: Grand Etang (R. Thaxter).

5. OTOCRYPTOPS MELANOSTOMUS (Newport).

Scolopocryptops melanostoma Newport, Trans. Linn. soc. London, 1844, **19**, p. 406.

Otocryptops melanostoma Pocock, Journ. Linn. soc. London, 1894, **24**, p. 464;[1] Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 564.[2]

Habitat.— HAITI: Furcy (W. M. Mann). PORTO RICO: Monte Mandios, Utuado (W. M. Wheeler).[2] ST. VINCENT (H. H. Smith).[1]

6. SCOLOPOCRYPTOPS MIERSII Newport.

Trans. Linn. soc. London, 1844, **19**, p. 405; Meinert (in part min.), Proc. Amer. philos. soc., 1886, **23**, p. 181.[1]

Habitat.— HAITI: Furcy (W. M. Mann). MARTINIQUE.[1] TRINIDAD: Arima, Verdant Vale (R. Thaxter).

7. NEWPORTIA ERNSTI Pocock.

Ann. mag. nat. hist., 1891, ser. 6, **8**, p. 161.[1]

Habitat.— HAITI: Diquini, Grand Riviere, Emery, Manneville, St. Marc, Milot, Cape Haitien, Jacmel, Petionville (W. M. Mann). ST. VINCENT (H. H. Smith).[1]

8. NEWPORTIA LONGITARSIS (Newport).

Scolopocryptops longitarsis Newport, Trans. Linn. soc. London, 1844, **19**, p. 407, pl. 40, fig. 10.

Newportia longitarsis (Newport) Pocock, Journ. Linn. soc. London, 1893, **24**, p. 466;[1] Kraepelin, Revis. Scolop., 1903, p. 86.[2]

Habitat.— CUBA[2]: Guantanamo (C. T. Ramsden), Trinidad, Loma del Marín (T. Barbour, W. S. Brooks). HAITI: Petionville, Port au Prince, Furcy, Manneville, Jacmel (W. M. Mann). ST. VINCENT (H. H. Smith).[1] GRENADA: Grand Etang (R. Thaxter).

9. NEWPORTIA PUSILLA Pocock.

Journ. Linn. soc. London, 1893, **24**, p. 468.[1]

As suggested by Kraepelin (Revis. Scolop., 1903, p. 88), the type of this species may prove to be only a young individual of *N. longitarsis* (Newport).

Habitat.— ST. VINCENT (H. H. Smith).[1]

10. NEWPORTIA CUBANA Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 497.

Habitat.— CUBA: Juan Guerra, Sagua de Tanamo, Guantanamo, Arroyo Hondo (C. T. Ramsden).

11. NEWPORTIA HETEROPODA, sp. nov.

Type.— M. C. Z. 1,872. Cuba: Belona Oriente, 16 January, 1914. C. T. Ramsden.

This species seems closely related to *N. longitarsis* but presents obvious differences. The two species are at once to be distinguished by differences in the anal legs. As in *N. longitarsis* the present species bears on the prefemur of the anal legs a series of four long, distally curved, spines shorter than the diameter of the article. The succeeding joint, however, differs in having in addition to the two small spines in line proximad of the middle also a third one distad of the middle. On the mesal side of the prefemur is a double series of short spinescent setae and such also occur, less strongly marked and more irregular, on the ectal surface. The tibia is slightly longer than the femur and of about the same thickness. The first joint of the tarsus is but half or little more than the length of the tibia than which it is but slightly more slender; it is gently clavately widened distad where it is obliquely truncate. A strongly marked characteristic of the species is that the following articles of the tarsus, which are distinctly separated and uniform and nine in number, are abruptly much more slender than the first one.

The paired sulci of the first tergite are simple, not forked anteriorly where they join the transverse sulcus. Transverse sulcus evenly semicircular, not free from the cephalic plate. On the second tergite on each side toward the anterior border a transverse sulcus or pale line parallel to the anterior margin and extending to the longitudinal sulcus.

Length 17 mm.

12. TIDOPS SIMUS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 495.

Habitat.— GRENADA: Richmond Hill (C. T. Brues, G. M. Allen).

OTOSTIGMIDAE.

13. OTOSTIGMUS SPICULIFER Pocock.

Otostigma spiculiferum Pocock, Journ. Linn. Soc. London, 1893, **24**, p. 461.[1]

Habitat.— ST. VINCENT (H. H. Smith).[1]

14. OTOSTIGMUS OCCIDENTALIS Meinert.

Otostigma occidentale Meinert, Proc. Amer. phil. soc., 1886, **23**, p. 185.[1]

Habitat.— HAITI: Grand Anse (Uhler).[1]

15. OTOSTIGMUS CARAIBICUS Kraepelin.

Revis. Scolop., 1903, p. 130;[1] Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 564.[2]

Habitat.— PORTO RICO: Utuado (W. M. Wheeler)[2]. ST. THOMAS.[1]

16. RHYSIDA LONGIPES (Newport).

Branchiostoma longipes Newport, Trans. Linn. soc. London, 1844, **19**, p. 411.
Branchiostoma gracile Kohlrausch, Archiv. naturg., 1881, **47**, p. 1, p. 66; Meinert, Proc. Amer. philos. soc., 1886, **23**, p. 182; Myr. Mus. Haun., 1886, p. 18.[1]

Habitat.— ST. CROIX.[1] ST. KITTS.[1]

17. RHYSIDA CELERIS (Humbert and Saussure).

Branchiostoma celer Humbert et Saussure, Rev. mag. zool., 1876, ser. 2, **22**, p. 202.

Habitat.— NEW PROVIDENCE (C. J. Maynard). JAMAICA: Kingston (S. Garman).

18. Rhysida nuda (Newport).

Branchiostoma nudum Newport, Trans. Linn. soc. London, 1844, **19**, p. 412.

Habitat.— Cuba: San Antonio de los Baños (T. Barbour, W. S. Brooks). Haiti: Milot, Diquini (W. M. Mann).

Not previously recorded from the West Indies.

19. Rhysida aspera Kraepelin.

Revis. Scolop., 1903, p. 149.[1]

Habitat.— Jamaica.[1]

Scolopendridae.

20. Cupipes guildingi (Newport).

Cormocephalus guildingi Newport, Trans. Linn. soc. London, 1845, **19**, p. 425.
Cormocephalus impressus Porat, Bih. Svensk. vet.-akad. Handl., 1876, **4**, no. 7, p. 15.[1]
Cupipes ungulatus Meinert (in part), Proc. Amer. philos. soc., 1886, **23**, p. 187.[2]
Cupipes guildingii Pocock, Journ. Linn. soc. London, 1894, **24**, p. 460.[3]
Cupipes impressus Kraepelin, Revis. Scolop., 1903, p. 181.[4]
?*Cupipes ungulatus* Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 564.[5]

Habitat.— Cayman Brac (W. W. Brown, Jr.). Jamaica:[3] Liguanea Plain (C. T. Brues). Haiti: Manneville, Diquini, Petionville, Momance (W. M. Mann), Grand Anse (P. R. Uhler),[2] Port au Prince (W. Wilson).[2] Santo Domingo.[1] Culebra.[5] St. Bartholomew.[1] Dominica.[3] St. Vincent.[3] Grenada: Grand Etang (C. T. Brues, G. M. Allen, R. Thaxter).

21. Cupipes lineatus (Newport).

Cormocephalus lineatus Newport, Trans. Linn. soc. London, 1845, **19**, p. 425.[1]

Habitat.— St. Vincent (Guilding).[1]

22. Scolopendra gigantea Linné.

Syst. nat. ed. 10, 1758, **1**, p. 638;[1] Pocock, Journ. Linn. soc. London, 1893, **24**, p. 458.[2]
Scolopendra gigas Leach Meinert, Myr. Mus. Haun., 1886, **3**, p. 26.[3]

Habitat.— Jamaica.[1,2] St. Thomas.[2] Trinidad.[3]

23. SCOLOPENDRA ANGULATA Newport.

Ann. mag. nat. hist., 1884, **13**, p. 97; Pocock, Journ. Linn. soc. London, 1893, **24**, p. 458;[1] Kraepelin, Revis. Scolop., 1903, p. 234.[2]

Scolopendra prasina C. L. Koch Meinert, Proc. Amer. philos. soc., 1886, **23**, p. 192.[3]

Habitat.— ST. THOMAS.[2] ST. VINCENT (H. H. Smith).[1] TRINIDAD (Peter Gelliman).[3]

24. SCOLOPENDRA VIRIDICORNIS Newport.

Ann. mag. nat. hist., 1844, **13**, p. 97; Kraepelin, Revis. Scolop., 1903, p. 236.[1]

Habitat.— ANTILLES (?).[1]

A common species in South America; but I have not personally seen specimens of it taken in any of the West Indies.

25. SCOLOPENDRA VIRIDIS Say.

Proc. Acad. nat. sci. Phil., 1821, p. 110.

Habitat.— JAMAICA: Cinchona (C. T. Brues).

25a. SCOLOPENDRA SANATILLAE Bollman.

Bull. 46, U. S. N. M., 1893, p. 199.[1]

Habitat.— SANATILLA.[1] SWAN ISLAND (Geo. Nelson).

26. SCOLOPENDRA ALTERNANS Leach.

Trans. Linn. soc. London, 1812, **11**, p. 383; Pocock, Journ. Linn. soc. London, 1893, **24**, p. 458.[1]

Habitat.— NEW PROVIDENCE: Nassau (T. Barbour, O. Bryant, C. J. Maynard). Andros: Mangrove Cay (O. Bryant). GREAT INAGUA. CUBA: Maisi (Torre), Sierra de Caballos (T. Barbour, W. S. Brooks), San Antonio de los Baños (T. Barbour, W. S. Brooks), Guantanamo, La Cabrera (C. T. Ramsden), Los Negros in Jiguaní (T.

Barbour), Guantanamo, Monte Libano (C. T. Ramsden), Soledad, near Cienfuegos (T. Barbour), Bolondron (W. M. Wheeler), Trinidad, Loma del Marín (T. Barbour, W. S. Brooks). ISLE OF PINES: La Ceiba (T. Barbour, W. S. Brooks). HAITI: Diquini, Petionville, Manneville, Grand Riviere, Momance (W. M. Mann), Jeremie (D. F. Weinland), Cape Haitien. SANTO DOMINGO.[1] ST. THOMAS.[1] ST. CROIX.[1] ST. BARTHOLOMEW.[1] ST. EUSTATIUS.[1] ST. KITTS.[1] ANTIGUA.[1] MONTSERRAT.[1] GUADELOUPE: St. Rose (G. K. Noble). TOBAGO (W. E. Broadway).

27. SCOLOPENDRA HIRSUTIPES Bollman.

Bull. 46, U. S. N. M., 1888, p. 198.[1]

Habitat.— WEST INDIAN fauna.[1]

A somewhat uncertain species.

28. SCOLOPENDRA MORSITANS Linné.

Syst. nat. ed. 10, 1758, **1**, p. 638.

Habitat.— NEW PROVIDENCE: Nassau (C. J. Maynard). HAITI: Jeremie (D. F. Weinland), Port au Prince (W. Wilson), Grand Anse (P. R. Uhler), St. Marc (W. M. Mann). PORTO RICO (M. Cardoze). ST. KITTS.

29. SCOLOPENDRA SUBSPINIPES Leach.

Trans. Linn. soc. London, 1814, **11**, p. 383.

Habitat.— CUBA. JAMAICA: Kingston. HAITI: Jeremie (D. F. Weinland). PORTO RICO: Ponce (Helen Emery). ST. THOMAS (S. Garman). ST. CROIX.[1] ST. BARTHOLOMEW.[2] ST. KITTS: Basseterre (S. Garman). ANTIGUA.[1] MONTSERRAT.[1] GUADELOUPE.[3] MARIE GALANTE.[3] DOMINICA.[1] ST. VINCENT.[1] BARBADOS.[1] TRINIDAD.[4]

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[1] *Fide* Pocock. [2] *Fide* Porat. [3] *Fide* Gervais. [4] *Fide* Daday.

SCHENDYLIDAE.

30. PECTINIUNGUIS INSULANUS Brölemann and Ribaut.

Bull. Soc. ent. France, 1911, p. 219.[1]

Habitat.— CUBA (P. Serre).[1]

31. ADENOSCHENDYLA PAUPERATA (Silvestri).

Pectiniunguis pauperatus Silvestri, Mitt. Naturh. mus. Hamburg, 1907, **24,** p. 247.[1]

Habitat.— ANTILLES (imported to Hamburg).[1]

32. PLEUROSCHENDYLA NESIOTES, sp. nov.

Type.— M. C. Z. 1,873. Haiti: Diquini. W. M. Mann.

This species agrees with the West African *P. chevalieri* in having the claws of the second maxillae completely pectinate, the median arc of the labrum armed with true stout teeth abruptly differentiated from the lateral ones, the pleurite of the second maxillary segment produced forward mesad of the segmental pore to the coxosternum with which it is fused, the pore being thus completely surrounded, the ventral pores arranged in a submedian circular area on the sternites, and in having the pores of the last coxopleurae composite.

The teeth of the median arc in the type number fifteen as against twenty in *P. chevalieri.* The pleurite of the second maxillary somite is differently formed, extending farther caudolateral as a more distinctly separated lobe and with the tongue projecting forward on the mesal side of the pore narrower. The cephalic plate is proportionately longer, the length to width being as 5:4. The cephalic plate in the type extends over the edge of the basal plate, and the first tergite is drawn much forward over it, the exposed portion being very short. In a young paratype (M. C. Z., 1,874), however, the basal plate is wholly free and long and the prebasal plate is exposed. The femuroid of the prehensors is armed on the mesal side at the distal end with a stout, strongly chitinous tooth.

The last coxopleurae are densely shortly hairy as in *P. chevalieri* but the mesal angle is not so strongly produced caudad. The last ventral plate in the male has the caudal margin straight or but very slightly incurved, not deeply emarginate as in *P. chevalieri*. The last tergite is shorter though still long, not completely covering the genital segments from above.

Ventral pores occur from the first sternite, on which there are very few, to the penult inclusive instead of being absent from the first two and the last three. A conspicuous feature not mentioned in the description of *P. chevalieri* is in the pitting of the anterior face of the anterior sternites with the production of the caudal face of preceding sternites as triangular pegs fitting into the excavations.

Pairs of legs fifty-five.

Length 34 mm.

A small broken specimen from Jacmel, (M. C. Z. 1,875), was also collected by Dr. Mann.

ORYIDAE.

33. NOTIPHILIDES MAXIMILIANI (Humbert and Saussure).

Notiphilus maximiliani Humbert et Saussure, Rev. mag. zool., 1870, ser. 2, **5**, p. 205.

Notiphilides maximiliani, (Humbert & Saussure) Pocock, Journ. Linn. soc. London, 1894, **24**, p. 473.[1]

Habitat.— GRENADA.[1]

34. ORPHNAEUS BREVILABIATUS (Newport).

Geophilus brevilabiatus Newport, Trans. Linn. soc. London, 1844, **19**, p. 436.

Orphnaeus brasiliensis (Humbert & Saussure) Bollman, Proc. U. S. N. M., 1888, **11**, p. 337.[1]

Habitat.— ANDROS: Mangrove Cay (O. Bryant). CUBA.[1] JAMAICA: Montego Bay (E. A. Andrews).

35. TITANOPHILUS MAXIMUS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 502.

Habitat.— HAITI: Grand Riviere (W. M. Mann).

36. TITANOPHILUS FRATRELLUS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 505.

Habitat.— HAITI: Petionville (W. M. Mann).

CHILENOPHILIDAE.

37. NESIDIPHILUS MARGINALIS (Meinert).

Geophilus marginalis Meinert, Proc. Amer. philos. soc., 1886, **23**, p. 218.

Habitat.— NEW PROVIDENCE (C. J. Maynard). CUBA: Soledad, near Cienfuegos (T. Barbour). Trinidad, Loma del Marín (T. Barbour, W. S. Brooks). JAMAICA: Port Morant.

38. NESIDIPHILUS LATUS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 512.

Habitat.— JAMAICA: Blue Mt. Peak.

39. NESIDIPHILUS MONTIS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 513.

Habitat.— CUBA: Monte Verde.

40. NESIDIPHILUS JUVENIS, sp. nov.

Type.— M. C. Z. 1,877. Haiti: Petionville, November, 1912. W. M. Mann.

This is the only representative of the genus thus far known from Haiti.

The young type is yellow in color, with the head and prehensors orange.

Cephalic plate widest at level occupied by frontal suture when present, narrowing from there moderately caudad. Anterior and caudal margins truncate, the corners rounded. Basal plate not free, proportionately short, shorter than in *N. latus*.

Anterior border of prosternum with median incision very narrowly v-shaped, an obtuse angle each side of the incision. Prehensors when closed surpassing the distal end of the first antennal article. Femuroid widest at base, not bulging above base as in *N. latus*, with at distal end a prominent acute black tooth. Tooth at base of claw also black, prominent and acute.

First legs small, the second intermediate. Anal legs much exceeding the penult as usual, with a minute transparent terminal appendage.

Last ventral plate broad, strongly narrowing caudad.

Pairs of legs forty-nine.

Body of the type, which is young, 12 mm. long, slender throughout.

41. TELOCRICUS CUBAE Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 517.

Habitat.— CUBA: Soledad, near Cienfuegos (T. Barbour), Trinidad, Loma del Marín (T. Barbour, W. S. Brooks).

42. TELOCRICUS FRATER Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 518.

Habitat.— CUBA: Monte Verde (Chas. Wright).

43. TELOCRICUS MAJOR Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 519.

Habitat.— CUBA: San Diego de los Baños.

44. TELOCRICUS MULTIPES Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 521.

Habitat.— HAITI: Manneville (W. M. Mann).

45. TELOCRICUS HYPER, sp. nov.

Type.— M. C. Z. 1,878. ♂. Cuba: Guantanamo, San Carlos. C. T. Ramsden.

The cephalic and basal plates and the prehensors are dilute chestnut. The remaining portion of the body and the legs are yellow, the antennae yellow with a vague chestnut tinge.

Cephalic plate formed as in *T. cubae,* the sides straight and slightly converging caudad and all corners oblique. Cephalic plate 1.6 + times longer than wide. The basal plate is narrower and longer than in *T. cubae* with the sides conspicuously incurved instead of straight and the exposed region of the plate only slightly more than twice (2.1) as wide as long as against three times wider in *T. cubae* and from four to five times wider in *T. major,* another Cuban species. The antennae are slightly more than three (3.1) times longer than the cephalic plate, being thus shorter than in *T. cubae* and decidedly longer than in *T. major.*

The prosternum is equal in length and breadth and is 1.72 times longer than the greatest height of the femuroid, the prehensors appearing obviously proportionately smaller than in *T. cubae.* The prosternal teeth are larger than in either *T. cubae* or *T. major* and the mesal edges slant more while the teeth are obviously farther apart and nearer to the prehensors.

The first four spiracles are very large, vertically elliptical, the fifth and following ones abruptly much smaller.

First legs much smaller than the second. Anterior legs obviously stouter than the posterior ones.

The general structure of the last pediferous segment as in other species of the genus. The coxopleurae less densely pilose than in *T. major.* The last ventral plate proportionately broader and shorter than in that species and anteriorly much wider and with sides much more strongly converging caudad than in *T. major.*

Legs greater in number than in the other Cuban species, one hundred and three pairs being present in the type.

Length, 65 mm.

46. LESTOPHILUS HAITIENSIS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 526.

Habitat.— HAITI: Furcy (W. M. Mann).

47. LESTOPHILUS NESIOTES Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 527.

Habitat.— HAITI: Petionville (W. M. Mann).

GEOPHILIDAE.

48. PIESTOPHILUS TENUITARSIS (Pocock).

Geophilus tenuitarsis Pocock, Ann. mag. nat. hist., 1888, ser. 6, **2**, p. 475, pl. 16, fig. c–c.[1]

Habitat.— DOMINICA.[1]

48a. LEPTOPHILUS CARRIBEANUS Chamberlin.

Bull. M. C. Z., 1915, **59**, p. 529.

Habitat.— SWAN ISLAND (G. Nelson).

49. GEOPHILUS MUSTIQUENSIS Pocock.

Journ. Linn. soc. London, 1893, **24**, p. 470.[1]

Habitat.— MUSTIQUE (H. H. Smith).[1]

50. GEOPHILUS CULEBRAE Silvestri.

Bull. Amer. mus. nat. hist., 1908, **24**, p. 564, fig. 1.[1]

Habitat.— CULEBRA.[1]

MECISTOCEPHALIDAE.

51. MECISTOCEPHALUS GUILDINGI Newport.

Trans. Linn. soc. London, 1844, **19**, p. 429;[1] Meinert, Naturh. tiddskr., 1870, ser. 3, **7**, p. 96;[2] Pocock, Journ. Linn. soc. London, 1893, **24**, p. 470.[3]
Mecistocephalus punctifrons (in part), Meinert Bollman, Proc. U. S. N. M., 1888, **11**, p. 337.[4]

Habitat.— CUBA.[4] JAMAICA:[3] Port Antonio (A. E. Wight). HAITI: Grand Riviere (W. M. Mann). ST. CROIX.[2] ST. VINCENT.[1]

52. TAENIOLINUM SETOSUM Pocock.

Journ. Linn. soc. London, 1893, **24**, p. 472.[1]

Habitat.— ST. VINCENT (H. H. Smith).[1]

Taeniolinum is too imperfectly known to be referred to with certainty to its family. It may possibly belong to the Ballophilidae, though not having the characteristic club-formed antennae of that group and apparently having the ventral pores different in position.

SCUTIGERIDAE.

GONETHELLA, gen. nov.

Articles of antennae very short, much wider than long. First and second division of the antennae very long, composed of numerous articles, the first typically of above ninety and the second of more than two hundred. First tarsal division of anterior legs within the neighborhood of sixteen or seventeen articles. No spines detected on tergites in type, though the specimen is considerably rubbed. Second article of the female gonopods separated by a true, transverse articulation characterized in having the free arms of the genital coxosternum very long and conspicuously diverging caudad with the distal article shorter than these, more strongly chitinized, and strongly uncate.

Genotype.— *G. nesiotes,* sp. nov.

53. GONETHELLA NESIOTES, sp. nov.

Type.— M. C. Z. 1,879. Cayman Brac, July, 1911. W. W. Brown, Jr.

Sides of dorsum dark, somewhat marbled. The usual median dorsal light stripe. This encloses no darker markings and widens on the caudal portion of each tergite about the stoma saddle. The legs at present are ochraceous, showing no distinct markings but there are vague indications of darker areas on the proximal articles which may have been bleached out.

First division of antenna consisting of about ninety-five articles the second of over two hundred and fifty-five.

First tarsus of first legs consisting of seventeen articles, that of the second of sixteen, with the second division embracing thirty-six.

Stoma in each case reaching the edge of the posterior emargination. Last principal tergite with caudal margin straight.

Length of type (female) about 16 mm.

GONETHINA, gen. nov.

Differing from Gonethella in the apparently more primitive antennae in which the three divisions are obvious with the first two of these unusually short and consisting in each case of less than half as many articles as in the other genus, in the type forty and seventy-five respectively. Articles very short. Joints of first and second tarsi much fewer, six to nine or ten in the first and twenty to twenty-six in the second. The tergites are wholly free from spines, bearing only fine short hairs. Gonopods as in Gonethella.

Genotype.— *G. grenadensis*, sp. nov.

54. GONETHINA GRENADENSIS, sp. nov.

Type.— M. C. Z. 1,880. ♀. Grenada: Grand Etang, September, 1910.

In this species the median dorsal light stripe is proportionately very wide, in the middle region exceeding the width of the dark stripe on each side of it. The dorsal surface of the head is light, the light area enclosing two dark areas behind and two in front, each pair of dark areas obscurely united. Legs dark, paler distad, the dark color more or less clearly broken into annuli by narrow pale bands; the annuli on the tibiae especially distinct, there being three light rings one of which is distal, one median, and one a little distad of the base; the first division of the tarsus with a brighter annulus at its distal end.

Stoma saddles moderately elevated. Stoma attaining caudal edge, its lips projecting into the emargination. Last tergite with caudal margin mesally conspicuously incurved.

Antennae showing three distinct divisions of which the first two are comparatively short. The articles, excepting the nodals, are very short and closely crowded. The first division in the type consists of forty articles and the second of seventy-five while the number in the third is not ascertainable since it is broken off a little above its base, only about thirty-two articles being present.

First tarsus of first legs composed of nine or ten articles, the second tarsus of twenty-six. Second division of tarsus of eighth legs consisting of but twenty articles, the first of only six or seven.

The gonopods of general form of those in the *Gonethella nesiotes* but the second or free article longer. The second division strongly chitinous, dark, uncate.

Length, 9 mm.

55. PSELLIOPHORA FLAVIPES (Bollman).

Scutigera flavipes Bollman, Bull. 46, U. S. N. M., 1893, p. 200.[1]

Habitat.— ANDROS: Mangrove Cay (O. Bryant). SAN SALVADOR[1] [WATLINGS].

56. PSELLIOPHORA PULCHRITARSIS Verhoeff.

Sitz. Gesellsch. nat. freunde Berlin, 1904, p. 279.[1]

Habitat.— HAITI.[1]

57. PSELLIOPHORA CUBENSIS, sp. nov.

Type.— M. C. Z. 1,881. Cuba: Guantanamo, 1912. *Paratypes.*— M. C. Z. 1,882, 1,883. Cuba: Rio Seco in San Carlos, 1914. C. T. Ramsden.

This is a large species of characteristic color markings by which it is separable at once from the related *P. pulchritarsis* of Haiti. The dorsum is on each side deep chocolate-brown, often vaguely marbled, a much narrower light median longitudinal stripe extending over the entire length of the body including the head. This median pale stripe embraces a dark stripe not quite so deep in color as the sides, this stripe occupying most of the width of the pale band; the included dark stripe over the middle somites may be geminate by a fine pale longitudinal line, and in all the band is geminate on the stoma saddles. The pale area on the head posteriorly occupies the entire width between the eyes, narrowing forwards; it encloses a large dark area of similar shape but smaller which is geminate by a median longitudinal pale stripe the anterior sagittiform end of which is itself faintly geminate by a dark line. The sides of the head above about the eyes and antennae are chocolate-brown, the lower part pale. Sides greyish yellow and venter of body yellow. The legs are ochraceous and wholly without darker annuli, spots or other markings.

Number of segments in the second tarsi of legs seven to nine from thirty-five to forty-three, mostly above forty. In the eighth legs twenty segments in first tarsus as against eleven in *P. pulchritarsis* and in the fourth legs nineteen as against thirteen. First flagellum of antenna consisting in the type of eighty-two segments, the second flagellum of two hundred and nine *plus* as against sixty-two to sixty-four and one hundred and forty-six respectively in *P. pulchritarsis.*

The styoma saddles strongly elevated. Caudal margins of plates mesally not strongly excavated. The last dorsal plate with caudal margin only moderately concave with the median region of concavity not at all extended as in *P. pulchritarsis.*

A robust species. The type is 38 mm. long; with the antennae (not wholly complete) over 50 mm.

57a. PSELLIOPHORA CAVINCOLA, sp. nov.

Type.— M. C. Z. 1,884. *Paratype.*— M. C. Z. 1,885. Trinidad: Guacharo Cave, April 23, 1916. Taken on the wall of the cave, "far in." C. B. Williams and F. W. Urich.

A very large and robust species. The dorsum has on each side of broad stripe of deep chocolate to black color with a narrow marginal stripe and a clear median longitudinal stripe which encloses no such dark markings as occur in the preceding species and which extends across the head. The venter clear yellow. Legs yellowish with the prefemur and femur strongly marked with blackish or deep chocolate, the prefemur having above a distal dark annulus which is broken on the ventral side and a weaker subbasal one more widely broken ventrally. The femur above is dark over its distal half or this may be more or less segregated into a distal and a median band, the corresponding ventral subbasal dark band which shows more vaguely on the ventral side. The next joint or tibia shows three dark annuli which are more obscure; these are long in comparison with the light portions.

First flagellum of antenna with about seventy articles which are long. Total number in the second division uncertain. First joint of first tarsal division of legs very long. First tarsal division of fourth legs with nineteen joints; first division of eighth legs in type with but twelve joints.

Stoma saddles strongly elevated. Caudal margins of ordinary tergites mesally moderately emarginate. Last tergite with caudal end conversely rounded, not at all incurved as in *P. cubensis* and *P. pulchritarsis.*

Length near 36 mm.

58. PSELLIOPHORA MINOR, sp. nov.

Type.— M. C. Z. 1,887. Cuba: Guantanamo, San Carlos Estate, April 22, 1914. C. T. Ramsden.

This small species resembles *P. cubensis,* of which I at first suspected it of being the young, in having the median pale stripe covered excepting in a narrow line at each side by an enclosed dark stripe though the latter is deeper and more strongly marked than in the other species; on the head it has the characteristic form as in *P. cubensis.* The lateral edges of the tergites are pale, the light stripe very narrow and sharply limited and extending also along caudal margin. The dark bands deep chocolate colored. The coloration is strikingly different from that of *P. cubensis* in the case of the legs which are strongly marked with dark. The cross bars or annuli of femur and prefemur more or less confluent above, incomplete ventrally and more obviously separated. Tibia darkened in longitudinal stripes except for a conspicuous annulus at distal end which is bright whitish.

Unlike *P. cubensis* the last tergite is not posteriorly incurved but on the contrary is strongly obtusely produced, with the apex rounded.

Articles of first division of antenna about forty-eight, of the second one hundred and sixty or above. The articles in large part are exceptionally short, approaching the proportions of Scutigera.

The first division of the tarsus of the ninth legs is composed of only seven segments, the second of twenty-eight.

Length about 12.5 mm.

59. PSELLIOPHORA HAITIENSIS, sp. nov.

Type.— M. C. Z. 1,888. *Paratypes.*— M. C. Z. 1,701. Haiti: Grand Riviere: January, 1913. W. M. Mann. Four specimens of which two are immature.

In size and general appearance suggesting *P. minor*, but at once distinguished in having the last tergite with caudal margin mesally incurved. The dark stripe within the broader median dorsal pale stripe is much less marked, being obscure in front of the stomal region though prominent over the latter. The legs are not so distinctly annulate; most articles are obviously dusky over the ochraceous background. The prefemur with dark color relieved toward ends; the femur with a subdistal light annulus; the tibia dark excepting for a light ring at the distal end; tarsus dusky proximally, becoming clear yellowish distad.

Aside from the differences in color and size, this species differs from *P. pulchritarsis*, also from Haiti, also in having the caudal margins of sixth and seventh dorsal plates spinigerous. The concavity of the caudal border of the last plate is not mesally produced as in that species.

First division of antennae composed of forty-nine to fifty-six articles; the second of eighty-three to eighty-six with beyond this an incomplete third division in which, in the type, eighty additional articles are present and in a paratype one hundred and ninety. (In the right antenna of the type there is no distinct demarcation into major divisions).

Articles of first division of tarsi from seven to nine; of the second from twenty-three to thirty.

The gonopods of the usual general structure. The second article exceeding the proximal arm in length, immobile, being separated only by a suture, pale, finger-like, only slightly curved.

Length, 12.5 mm.

60. SCUTIGERA (?) GUILDINGI (Newport).

Cermatia guildingi Newport, Trans. Linn. soc. London, 1844, **19**, p. 356.
Scutigera guildingi Pocock, Journ. Linn. soc. London, 1893, **24**, p. 456.[1]

Habitat.— ST. VINCENT.[1] (H. H. Smith).[1]

The generic position of this and the following species cannot be determined from the descriptions. It is possible they may belong to Pselliophora.

61. SCUTIGERA (?) SUPERBA Meinert.

Vid. Medd. nat. foren., 1886, p. 104.[1]

Habitat.— WEST INDIES.[1]

DIPLOPODA.

GLOMERIDESMIDAE.

62. GLOMERIDESMUS MARMOREUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 476, pl. 37, f. 2–2m.[1]

Habitat.— ST. VINCENT. (H. H. Smith).[1]

63. GLOMERIDESMUS GRENADANUS, sp. nov.

Type.— M. C. Z. 4,297. Grenada: Grand Etang. November, 1912. *Paratypes.*— M. C. Z. 4,298, 4,299. Trinidad: Port of Spain. Roland Thaxter.

This form is very close in general appearance and structure to *G. marmoreus* Pocock, so far as may be judged from the description. It is separated because of a number of apparent differences, most obvious of which is the much greater size and different form of the penes. In Pocock's figure these are represented as shorter than the legs and as curving apart; in the present form the penes are nearly twice as long as the legs and much stouter. The inferior process of the penult tergite is proportionately shorter and is more slender and acute, while that of the preceding tergite is much narrower and more acute. Striation of tergites as in *G. marmoreus.* Color from somewhat dusky chestnut to nearly black, with symmetrical series of yellow marks along the dorsum and sides, these often becoming more obscure caudad, and in one specimen are obsolete throughout. The antennae are also blackish with a pale annulus about the proximal end of each article. Labrum and a stripe across vertex of head yellow as in *G. marmoreus.*

Length, 5–6 mm.

64. Glomeridesmus concolor, sp. nov.

Type.— M. C. Z. 4,295. *Paratypes,* M. C. Z. 4,296. Haiti: Jacmel. December, 1912, W. M. Mann.[1]

This species differs conspicuously in appearance from the preceding ones in lacking any distinct light markings, the color of the head and tergites being fuscous or blackish throughout, though under the microscope some individuals show very obscure traces of lighter markings arranged much as in the other species. Legs and under surface of the body yellowish. Antennae blackish, uniform. The impressed area above the base of each antenna is circular and sometimes yellow in color. The striations of the tergites are in general similar to those in the preceding species. The inferior processes of the posterior tergites are distinct; but they are throughout shorter and more obtuse than in the other species, the greater shortness and obtuseness being strikingly obvious in the case of the penult tergite.

Length, 4–6.5 mm.

Siphonophoridae.

65. Siphonophora portoricensis Brandt.

Bull. Acad. imp. sci. St. Petersb., 1836, **4**, p. 179.[1]

Habitat.— Porto Rico.[1]

66. Siphonophora cubana Karsch.

Mitth. Münch. ent. verein, 1880, **4**, p. 144.[1]

Habitat.— Cuba.[1]

67. Siphonophora tenuicornis Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 479, pl. 37, f. 4.[1]

Habitat.— St. Vincent.[1]

68. SIPHONOPHORA PROXIMA, sp. nov.

Type.— M. C. Z. 4,300. *Paratype.*— M. C. Z. 4,301. Haiti. W. M. Mann.

Color yellow. Tergites densely clothed with moderately long stiff hairs which are of uniform length throughout. The first tergite is shorter than the two following ones together; anteriorly it is lightly concave; it is twice as wide as the head at base. Rostrum slender, distally decurved, shorter than the head. Antennae exceeding the rostrum by half the length of the sixth article, in addition to the seventh, or more. Antennae strongly clavate, thick; the fifth article, like the more proximal ones, wider than long.

Number of segments 79 to 86.

Length up to 25 mm.; width, 1 mm.

69. SIPHONOPHORA GRACILIOR, sp. nov.

Type.— M. C. Z. 4,302. *Paratype.*— M. C. Z. 4,303. Haiti: Petionville. W. M. Mann.

As compared with *S. proxima,* this is a more slender species which differs obviously also in the much shorter and finer hairs of the dorsum excepting those of the anal tergite which are abruptly much longer than the others instead of being uniform with them as they are in *S. proxima.* The first dorsal plate is longer, equalling or exceeding the combined length of the next two. The rostrum exceeds the head in length. The antennae are correspondingly longer, the sixth joint being proportionately longer, more evenly cylindrical and not narrowed distad as in the otner species. The antennae exceed the rostrum by half the length of the sixth article as in *S. proxima.* The body is yellow below and along the sides; but along the dorsum it is darker and of an obscure reddish tinge.

Number of segments, ninety-six.

Length not accurately determined because of the strongly coiled condition of the type, but apparently between 20 and 30 mm.

70. SIPHONOPHORA MANNI, sp. nov.

Type.— M. C. Z. 4,304. Haiti: Grand Riviere. W. M. Mann.

This is at once separable from the two preceding Haitian species in having the rostrum much longer and in the longer antennae. The rostrum reaches only to the proximal end of the sixth article of the antennae. This form is darker than the others, more brown, especially anteriorly. The antennae contrast sharply in color with the adjacent part of the body, being bright yellow. The body is broader and flatter than in the other two species described from Haiti, and the hair is shorter, uniform in length.

Number of segments, eighty-one.

Length, 23 mm.; width, 1.1 mm.

71. SIPHONOPHORA ROBUSTA, sp. nov.

Type.— M. C. Z. 4,305. *Paratypes.*— M. C. Z. 4,306–4,307. Jamaica: Liguanea Plain, 1911. C. T. Brues.

This is a shorter and proportionately much broader species than any one of the Haitian species above listed. The head is shorter and more globose. The antennae are relatively very long and stout, exceeding the rostrum by the last three and a half to nearly four articles. The dorsum is densely clothed as usual with very short straight hairs, these being of uniform length throughout. The body above is brownish.

The number of somites is, in the typical adults, from fifty-five to sixty-four. A small specimen apparently this same species has but forty-four somites; its antennae are proportionately shorter than in the others.

Length of type, 17 mm.; width, 1.3 mm.

71a. SIPHONOPHORA TOBAGOANA, sp. nov.

Type.— M. C. Z. 4,308. Tobago: King Bay, April, 1914. *Paratypes.*— M. C. Z. 4,309, 4,310. Tobago: near Richmond Bay. H. L. Clark.

An unusually thin species; flattened dorsoventrally. Head rather elongate, equalling or exceeding the rostrum. The antennae long, exceeding the rostrum by the seventh, sixth, and half or more of the fifth articles of the antennae. Sixth article of antennae long, cylindrical. First tergite moderately mesally incurved anteriorly. Dorsum clothed with very short hairs, those of the anal segment being somewhat longer than the others. Color yellow of a distinctly reddish or orange tinge.

Number of somites in four adult specimens from eighty-nine to ninety-nine. The number in a small, immature specimen, is but sixty-four.

Length of type, 15 mm.

71b. SIPHONOCYBE HARTI (Pocock).

Siphonorhinus hartii Pocock, Ann. mag. nat. hist., 1895, ser. 6, **15**, p. 375.[1]

Habitat.— TRINIDAD[1]: Arima, Verdant Vale. (R. Thaxter).

POLYZONIIDAE.

72. SIPHONOTUS PURPUREUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 479, pl. 37, f. 5.[1]

Habitat.— HAITI: Emery, Grand Riviere, Cape Haitien (W. M. Mann). ST. VINCENT (H. H. Smith).[1] TOBAGO: near Plymouth. (H. L. Clark).

STEMMIULIDAE.

73. PROSTEMMIULUS COMPRESSUS (Karsch).

Stemmiulus compressus Karsch, Zeits. naturwiss., 1881, ser. 3, **6**, p. 11[1]; Pocock, Journ. Linn. soc. London, 1894, **24**, p. 478.

Diopsiulus compressus Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 566, f. II (1–8)[2].

Habitat.— PORTO RICO[1]: Utuado. (W. M. Wheeler).[2]

74. PROSTEMMIULUS WHEELERI Silvestri.

Diopsiulus wheeleri Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 568, f. III (1–8).[1]

Habitat.— CULEBRA. (W. M. Wheeler).[1]

75. PROSTEMMIULUS CLARUS, sp. nov.

Type.— M. C. Z. 4,311. Haiti: Jacmel. *Paratypes.*— M. C. Z. 4,312–4,317. Haiti: Diquini, Grand Rivière, Furcy, Manneville. W. M. Mann.

In this species there is a distinct, sharply marked median dorsal stripe of light color which is continuous throughout the length, or may be broken up into spots anteriorly as in *P. compressus.* There is a series of light spots along each side and a series of smaller light dots above this over the subdorsally placed repugnatorial pores. The under surface of the somites ectad of the legs is pale. Anal scutum and valves dark.

The body is robust. It is narrowed obviously both cephalad and caudad.

Ocelli strongly convex, the caudal one much the larger.

Collum strongly convex. Anterior margin mesally convex, slightly incurving on each side caudad of the antennae. Low down on each side two strong striae,— not presenting three keels as in *P. compressus.*

Anal scutum equalling the valves, bearing on each side three setiferous papillae and a median papilliform process as well. Anal valves with mesal margin considerably elevated, hirsute. Anal scale with caudal margin slightly emarginate at middle.

The male gonopods are obviously different from those of *P. compressus* and *P. wheeleri.* The mesal basal processes of the anterior gonopods are relatively much shorter than in *P. wheeleri* and are not distally acute and with tips curving ectad as in *P. compressus.* The intermediate process on each side curves caudoectad behind the principal plate and is curved at the tip. The principal plate is not concave along its distal margin as in *P. compressus.* Each posterior gonopod is much broader than in either of the other species mentioned and projects much beyond the first.

The male is much more slender than the female.

Length of female, 15 mm.; width 2 mm. Length of male type, about 12 mm.; width 1.2 mm. The maximum female is 20 mm. long.

76. PROSTEMMIULUS CUBAE, sp. nov.

Type.— M. C. Z. 4,318. *Paratype.*— M. C. Z. 4,319. Cuba: Guantanamo. C. T. Ramsden.

This species differs strikingly in coloration from *P. compressus* and

P. clarus. The median dorsal stripe is much broader; it is ochraceous and is in part tinged with red. The upper part of the side of each somite is brown, the brown area enclosing a light, areolated spot about each repugnatorial pore and fading out ventrad, leaving most of the side as well as the venter of the body pale and immaculate. No distinctly separated second series of light dots below the upper one, though the spots of the upper series may be prolonged ventrad. Head and anterior somites paler than the following ones, typically having a dilute ochraceous cast. The antennae are dark, the legs yellowish.

Body narrowed toward both ends as usual, robust.

Ocelli of usual type; upper or caudal one much the larger; black.

The collum with anterior border margined below on each side. A single striation toward each lower angle.

Anal scutum somewhat exceeded by the valves; with the usual six setigerous cones.

Number of segments, forty-three.

Length, 20 mm.; width, 2 mm.

77. PROSTEMMIULUS ROBUSTUS, sp. nov.

Type.— M. C. Z. 4,320. Cuba: Belona Oriente. C. T. Ramsden.

This is a much darker species than *P. cubae* with the median dorsal light stripe very much narrower, line-like, expanding into a small spot at anterior end of each tergite. Dorsum black on each side of the median pale line excepting along caudal border of each tergite, where the color is reddish or ferruginous; a small light spot about each repugnatorial pore. Sides lighter, brown or slightly chestnut with a distinct black stripe along the suture and another along the caudal border of each somite. In a number of the anterior segments following the first four the black extends continuously from the dorsum down the sides. First four segments and head pale ferruginous with vague dusky markings visible under lens; head blackish above and between the antennae, the area on vertex with numerous minute light dots. Legs yellow. Antennae blackish.

Ocelli black, strongly convex, the anterior proportionately larger than in *P. cubae,* the caudal one more posterior in position, obviously farther removed from the margin of the antennal socket.

Collum above lower end on each side with two deep striae above the margining sulcus and several shorter and weaker or obscure ones above these.

The other segments strongly striate, the striae running obliquely ventrocaudad and the two uppermost ones in the middle region of the body leaving a mid-dorsal triangular area on each somite with apex, which is anterior, a little truncate, each stria taking its origin on the front margin a little ectad of the median sulcus; striae not extending so high on first few segments while in the most caudal ones they meet at the middle, forming two or more triangles one outside the other.

Tubercles of anal scutum prominent, their setae long.

Number of segments, forty-four.

Length, near 27 mm.; depth, 2.8 mm.; width, 2.5 mm.

77a. STEMMIULUS INSULANUS, sp. nov.

Type.— M. C. Z. 4,321. Trinidad: near Port of Spain. Roland Thaxter. *Paratype.*— M. C. Z. 4,322 Trinidad: near Port of Spain. H. L. Clark.

In this species the head and the first three segments are light ferruginous without distinct darker markings. The following part of the body is abruptly darker. There is a very narrow mid-dorsal light line. Each average somite has the anterior half blackish, the posterior brownish of a pronounced purplish tinge, these two regions being separated by a narrow pale stripe which extends from the mid-dorsal stripe to the pale ventral region and expands in its course so as to produce two small dots of which there are thus two series. Legs yellow. Antennae dark. Last dorsal plate and anal valves ferruginous like the anterior region.

The body has the usual subfusiform shape but is especially strongly narrowed caudad.

Ocellus large, dark, strongly convex, situated immediately caudad of the antennal socket.

The collum is widely convex in front. The lower end is rounded, not truly angulate. Lower part crossed above margin by two sharp sulci below each of which the plate is ridged somewhat keel-like, with the posterior ends of these projecting as teeth or serrations.

Anal scutum caudally rounded, mesally emarginate, with the usual six setigerous cones additional to the median process. Anal valves a little exceeding the scutum.

Anterior gonopods of male excavated distally on the mesal side, strongly uncate, the apical region of each curving mesad and then proximad and terminating in an acute process or mucron. From its base behind a stout blade curves ectad.

Number of segments, forty-five.

Length (male type), 18 mm.

NANNOLENIDAE.

78. EPINANNOLENE DOMINICANA (Pocock).

Spirostreptus (*Nodopyge*) *dominicanus* Pocock, Ann. mag. nat. hist., 1888, ser. 6, **2**, p. 478.[1]

Habitat.— DOMINICA (G. A. Ramage).[1]

79. EPINANNOLENE CUBENSIS (Bollman).

Nannolene cubensis Bollman, Proc. U. S. N. M., 1888, **11**, p. 335.[1]

Habitat.— CUBA.[1]

This species is referred to Epinannolene only on the assumption that it is congeneric with the other known West Indian species of the family rather than with the Californian species *Nannolene burkei*, the type of Nannolene. The very brief account of *E. cubensis* does not supply the information needed for generic diagnosis.

80. EPINANNOLENE HAITIENSIS, sp. nov.

Type.— M. C. Z. 4,323. Haiti: Grand Riviere. *Paratypes.*— M. C. Z. 4,324, 4,325, 4,331. Haiti: Grand Riviere, Milot. W. M. Mann.

Banded with deep brown or almost black, the caudal portion of each segment from pale blue to nearly yellow. Anterior tergites above annulate in light. Other segments with a few simple lighter areas near the pore which are visible under the lens. Legs light brown to pale orange.

The ocelli more numerous than in *E. cubensis* and *E. dominicana*, numbering twenty or more, in four series in the lowermost of which the ocelli are very small: *e. g.*, 9, 7, 5, 3.

Unlike *E. dominicana* the collum shows a distinct though rounded anterior corner separating anterior from lateral margins. Above the lower margining sulcus only two striae, of which the lower anteriorly curves dorsad and reaches the level of the eye.

In the other segments the depression along the sulcus is very weak and the anterior half not depressed. The striation weaker than in other species of the genus, in no case extending above the ventral surface and thus always far removed from the pores.

Number of segments, forty-nine.

Length near 30 mm.; width, 2 mm.

81. Epinannolene ornata, sp. nov.

Type.— M. C. Z. 4,326. Haiti: Petionville. *Paratypes.*— M. C. Z. 4,327–4,329. Haiti: Petionville, Furcy, Port au Prince. W. M. Mann.

Readily distinguished from the other species in having a dilute ferruginous median longitudinal stripe along the dorsum, the tergites elsewhere being dark; each somite posteriorly brownish black with anterior border pale bluish. In young specimens the lower region of sides pale, more or less ferruginous yellow. First tergite and head ferruginous yellow excepting that in the latter there is a brown area between eyes and antennae embracing a clear spot just mesad of each antenna.

Ocelli in three series; *e. g.*, 9, 7, 5.

Collum margined as usual; on each side a very deep short sulcus running obliquely caudoventrad from near the lower level of eye, this joining at caudal end with a finer sulcus extending across the plate; two short sulci across caudal border below level of the deep oblique sulcus.

Segments not constricted. Strongly striate beneath, but the striae not extending up on the sides toward the pores as in *E. dominicana*.

Number of segments, forty-nine.

Length, about 23 mm.; width, 1.8 mm. A very large paratype from Furcy has a diameter of 2.6 mm.

82. EPINANNOLENE GRENADAE, sp. nov.

Type.— M. C. Z. 4,330. Grenada: Grand Etang. R. Thaxter.

This is a much more slender species than any of those listed above. The general color is brown to dusky above and flavous ventrally and over the lower portions of the sides and also in a band over the posterior borders of the somites and in a more narrow anterior band. In the anterior region of the body the brown portion of each somite encloses numerous light areas. The collum is thus areolate excepting in a band a little behind the anterior border where the dark color is solid. In the dark area between the eyes two small submedian light dots and also three light spots, two large and one much smaller and more mesal, just mesad of each antennal socket.

The antennae strongly clavate with the fifth and sixth articles clearly stoutest. Ocelli in two transverse (or subvertical) rows; *e. g.*, 7, 5.

The collum is evenly rounded below on each side.

The somites are very strongly constricted, the encircling furrow being deep and distinct, with the part of the annulus in front of it as high as that behind.

Number of segments, fifty-nine.

Length, about 18 mm.; width, 1 mm. or slightly less.

SPIROSTREPTIDAE.

83. ORTHOPORUS VENTRALIS (Porat).

Spirostreptus ventralis Porat, Bih. Svensk. vet.-akad. Handl., 1876, **4**, no. 7, p. 42.[1]

Habitat.— ST. THOMAS.[1]

84. ORTHOPORUS SCULPTURATUS (Karsch).

Spirostreptus sculpturatus Karsch, Zeits. naturwiss., 1881, ser. 3, **6**, p. 39.[1]
Orthoporus sculpturatus Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 573, f. VII (1–5).[2]

Habitat.— PORTO RICO[1]: Utuado, Santurce, and near Aibonito (W. M. Wheeler).[2]

85. ORTHOPORUS ABSTEMIUS (Karsch).

Spirostreptus abstemius Karsch, Zeits. naturwiss., 1881, ser. 3, **6**, p. 36.[1]

Habitat.— ?CUBA.[1]

85a. ORTHOPORUS NITIDUS (Daday).

Spirostreptus nitidus Daday, Term. füzetek, 1891, **14**, p. 137.[1]

Habitat.— TRINIDAD[1]: near Port of Spain. (R. Thaxter).

86. ORTHOPORUS ANTILLANUS (Pocock).

Spirotreptus antillanus Pocock, Journ. Linn. soc. London, 1894, **24**, p. 483, pl. 38, f. 1–11.[1]

Habitat.— ST. THOMAS.[1] ?GRENADA.[1]

86a. ORTHOPORUS TOBAGOANUS, sp. nov.

Type.— M. C. Z. 4,334. *Paratypes.*— M. C. Z. 4,341. Tobago, 1916. W. E. Broadway.

This species may be distinguished from *O. nitidus* (Daday) of Trinidad, to which it is very close, in having the distal lateral process of the gonopod of male much shorter and more inconspicuous, as well as in various other minor details of the gonopod. The color is typically much lighter brown, and not so distinctly banded. Legs much lighter instead of being dark and almost concolorous with the body, yellow to ferruginous. One male appears somewhat mottled with lighter color along the sides. Antennae brown to chestnut. Sculpturing of somites similar but weaker.

Number of segments, fifty-seven or fifty-eight as against sixty or sixty-one in *O. nitidus.*

Smaller than *O. nitidus,* the length of the type, the largest of the specimens secured, being about 90 mm., with the diameter 6 mm.

87. ORTHOPORUS GRENADAE, sp. nov.

Type.— M. C. Z. 4,335. Grenada: Richmond Hill, August 25, 1916.

This species is close to *O. antillanus* and possibly was embraced under that name by Pocock who records it from Grenada as well as from St. Thomas. It differs from the form of which the gonopod is figured by Pocock in having the distal lateral process or spine much smaller and extending distad or a little mesad of distad instead of directly ectad; the funnels are also carried farther distad and closer to the principal part than indicated in the figure mentioned, with the tube more strongly bent; the median proximal piece is very similar, being less strongly arched, distally less angular. The coloration and sculpturing as in the latter species. The body is considerably more slender.

Number of segments (male), sixty.

Length near 100 mm.; width, 5.25 mm.

88. ORTHOPORUS HAITIENSIS, sp. nov.

Type.— M. C. Z. 4,336. Haiti: St. Marc, January, 1913. W. M. Mann.

A much smaller species than the two above described and than *O. nitidus* and *O. antillanus*. Near *O. ventralis* in structure though likewise much smaller than that form. Body strongly narrowed cephalad. Somites black about middle, the anterior and posterior borders ferruginous. Legs ferruginous. A dark band extending across face between eyes and antennae, this embracing a pale spot in each lower corner. Collum bordered all around with black.

Differing from *O. ventralis* in having the eyes smaller, composed of fewer ocelli, and separated by nearly twice their diameter instead of only once. Vertigial sulcus fine.

Collum in side view showing below two very deep sulci above the submarginal one, the upper one curving upward within the anterior margin. Not dilated below as in *O. ventralis.*

Striae of most segments falling much short of extending up to the pore.

Anal scutum caudally rounded; caudal portion depressed and roughened, coriaceous, the principal portion minutely subdensely punctate. Anal valves mesally strongly compressed and elevated.

Number of segments, fifty-five.

Length near 52 mm.; width, 4.2 mm.

89. ORTHOPORUS (?) INDUS (Pal. Beauvois).

Julus indus Pal. Beauvois, Ins. Afrique Amér., 1805, p. 154, pl. 6, f. 2;[1] Pocock, Journ. Linn. soc. London, 1894, **24**, p. 506.
Julus beauvoisi Gervais, Ins. apter., 1847, **4**, p. 191.[2]

Julus beauvoisi, proposed by Gervais as a substitute for *I. indus,* seems to have been extended incorrectly to the form described by that author from Martinique, as pointed out by Pocock (*Loc. cit.*, p. 507).

Habitat.— SANTO DOMINGO.[1,2]

ANETHOPORUS, gen. nov.

Differing from Orthoporus in having the seminal style of the male gonopods wholly naked, not issuing from a vase-shaped lamina, and very long, curving behind the gonopods and ending on the opposite side, thus crossing the other style. The gonopod ends distally in an auriculiform membrane which is bent so as to be concave on the ectal side and presents a secondary smaller fold on the ectal side; between the two folds in the type is a short rod or styliform process.

Genotype.— *A. clarki,* sp. nov.

89a. ANETHOPORUS CLARKI, sp. nov.

Type.— M. C. Z. 4,337. *Paratypes.*— M. C. Z. 4,338. Trinidad: Port of Spain, La Sieva Valley, April, 1916. H. L. Clark.

Color in general brown to testaceous with the posterior margin above bordered with a narrow stripe of dark brown to chestnut, the stripe narrowing down the sides. Collum with a dark band across anterior border just caudad of a narrow yellow margin, this dark stripe expanded near middle, and a narrower band along the caudal marginal yellow stripe, this also extended forward at the middle; the remaining portion of collum covered with a network of dark lines. Head dark, a sagittate tongue of dark color extending down between antennae outlined by a lighter area and above it, two small light dots; labrum bordered narrowly with ferruginous; vertex above with numerous light dots and also light along the sulcus. Anal scutum dark excepting caudally above and in a narrow marginal stripe on each side below. Valves dark or sometimes merely dusky over a lighter background, the mesal margins light. Legs flavous. Antennae either the same or darker and with distal end light.

Sulcus evident only across vertex. Labral setiferous cones 2 + 2. Antennae short, sixth joint expanded, sensory cones four. Ocelli in each eye in five transverse series; thus, 10, 7, 7, 4, 2 (1).

Collum with lateral margin straight, corners narrowly rounded. Margined below and in front except dorsally. Above lower border a very deep oblique sulcus.

Pores beginning on somite six, very small, just caudad of suture. Suture deep and distinct. Segments caudad of suture deeply striate beneath, toward the pore becoming short and extending only a short distance from the suture. The overlapped anterior region of somite densely and very finely transversely striolate.

The anal valves very strongly compressed, the mesal margins being exceptionally elevated. Anal tergite triangularly produced caudally, much exceeded by the valves.

Number of somites, sixty and near that number.

Length up to 85 mm.; width to 5.1 mm.

89b. Anethoporus gracilior, sp. nov.

Type.— M. C. Z. 4,339. *Paratypes.*— M. C. Z. 4,340. Tobago: near Richmond and King Bays. H. L. Clark.

Readily distinguished from the other species in being very much smaller and more slender. General color brown, becoming light ferruginous in the anterior region. Each typical somite encircled by a dark band in front of the caudal, overlapping border, this band embracing an irregular light spot on each side, this spot with a network of dark lines and breaking through the stripe anteriorly; anterior border pale; the dark band extended farther forward on dorsum. Collum with dark anterior and posterior transverse stripes as in *A. clarki*, these within the borders and extended in the mid-dorsal region. Head with a fine meshwork of dark lines above; a dark band between the eyes, this band extended in a sagittate mark as in *A. clarki*, and also with a dark line extending ventrad just mesad of each antennal socket; the remaining portion of face light, much more so than in the other species. The anal valves dark. The anal scutum also of solid dark color excepting across proximal end where it shows a network of dark lines over a paler background.

Eyes smaller, with fewer ocelli in fewer series: *e. g.*, 5, 6, 3, 2.

Collum contrasting in running to an angle below on each side where it is narrowly rounded, the lateral margin not straight as in the other species. Strongly margined up side of anterior border.

Anal valves much exceeding the scutum, the mesal margins exceptionally elevated as in the type-species.

Number of segments fifty-six as against sixty in the other species.

Length (type), near 40 mm.; width, 2.2 mm. Specimens from King Bay with diameter up to 3.1 mm.

Spiroboloidea.

90. Rhinocricus ramagei Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 489.[1]

Habitat.— St. Lucia.[1] (G. A. Ramage).

91. Rhinocricus mandevillei Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 489.[1]

Habitat.— Jamaica: Mandeville[1] (T. D. A. Cockerell, T. Barbour).

92. Rhinocricus politus Porat.

Ann. Soc. ent. Belg., 1889, **32**, p. 243;[1] Pocock, Journ. Linn. soc. London, 1894, **24**, p. 488.

Habitat.— Antigua.[1]

93. Rhinocricus townsendi Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 505.[1]

Habitat.— Jamaica. (T. Townsend.)[1]

94. Rhinocricus gossei Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 490, pl. 38, f. 2.[1]

Habitat.— Jamaica. (P. H. Gosse.)[1]

95. RHINOCRICUS RARIOR, sp. nov.

Type.— M. C. Z. 4,342. Haiti: Grand Riviere. W. M. Mann.

Belonging in that relatively small group of West Indian species having no scobina. It differs from the other Haitian species of the group, *R. mandevillei,* among other features, in having the suture dorsally obscure instead of deep and complete. The head and collum are ferruginous. The anal scutum is shining black with narrow flavous caudal border. The anal valves are dusky over a ferruginous ground. The other segments are black with narrow ferruginous caudal border which above does not extend to the suture but attains or extends beyond it down low on the sides. Legs and antennae ferruginous.

Collum widely rounded below. Weakly margined about the lower anterior corner. Failing much of attaining the lower margin of the second tergite which is not excavated below.

Sutures straight, not at all or only very weakly curved opposite the pores.

Number of segments, forty-seven.

Length about 45 mm.; width, 4 mm.

96. RHINOCRICUS EXCISUS Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 73; Pocock, Journ. Linn. soc. London, 1894, **24**, p. 491.[1]

Habitat.— JAMAICA.[1]

97. RHINOCRICUS NEWTONIANUS, sp. nov.

Type.— M. C. Z. 4,343. *Paratypes.*— M. C. Z. 4,344. Jamaica: Newton, January, 1912. C. T. Brues.

This species is like *R. parcus* and *R. holomelanus* in having the posterior border of some of the anterior somites bisinuate above the scobina, but aside from being a very much smaller species differs strikingly in color as well as in structural details. In coloration it much resembles *R. heteroscopus,* having a series of black transverse bands across the dorsum, each band in front of the suture, on each side of which there is a sharply marked longitudinal pale stripe with below dark vertical stripes narrowing ventrad as in the species mentioned, the somites being elsewhere ferruginous. The collum in front of the middle has a transverse stripe of black which widens at the middle and sends an acute branch to the anterior margin; in front of this the border is yellow, with a disconnected mark of the same color above each lateral end; elsewhere the collum is ferruginous with over it a network of darker lines. The anal scutum is blackish, with each free lateral border narrowly margined with yellow. Anal valves dusky. Head ferruginous, with a conspicuous black mark in the form of an inverted Y.

Collum rounded below as usual, margined laterally. Not attaining lower edge of second tergite.

Pore in line with suture which curves strongly about it. Suture weak, or obliterated in some cases, above.

Anal scutum narrowly rounded caudally, much exceeded by the anal valves which in side view protrude strongly convexly.

Number of segments, forty-two.

Length, 31 mm.; width up to 4 mm., the species being proportionately stout.

98. RHINOCRICUS PARCUS Karsch.

Zeits. naturwiss, 1881, ser. 3, **6**, p. 68; Pocock, Journ. Linn. soc. London, 1894, **24**, p. 491.[1]

Habitat.— PORTO RICO.[1]

99. RHINOCRICUS ELECTUS, sp. nov.

Type.— M. C. Z. 4,345. Cuba: Guantanamo, Mal Paso "El Palmar," April 3, 1913. C. T. Ramsden.

A species like *R. parcus* and *R. holomelanus* in having the posterior margin of anterior somites above the scobina conspicuously bisinuate. It is like *R. holomelanus* in having the pores high above the middle, and has a similar habitus and general structure to that species but, aside from being smaller, is readily distinguishable in having the suture of the segments more strongly marked and traceable entirely across the dorsum. Also in contrast with that species the segments are annulate with flavoferruginous along the caudal border, these light bands becoming more obscure caudad but very sharply defined in the middle and anterior region. Collum black excepting for narrow light borders. Head dark. Anal scutum black at base, brown caudally. Anal valves brown.

Collum not at all or only obsoletely margined below. Second tergite extending a little below it, indented or excavated beneath.

Anal scutum with surface highly coriarious, exceeded by the valves. Valves distinctly compressed.

Number of somites forty-seven.

Length, 50 mm.; width, 6.8 mm.

100. RHINOCRICUS MEDIATOR, sp. nov.

Type.—M. C. Z. 4,414. *Paratypes.*—M. C. Z. 4,415. Haiti: Furcy. W. M. Mann.

This belongs with the scobinate species of Rhinocricus having but a single suture on the somites and the anal scutum not prolonged beyond the valves. In size it is smaller than *R. domingensis, R. maltzani, R. haitensis,* and so forth, and larger than *R. solitarius* and related new species above described. The suture in the anterior somites is strongly marked across the dorsum but in the middle and posterior regions is weak or obscure; it is distinctly sinuate about the pore. Scobina continuing to well caudad of middle region of body.

The collum is marginate along the anterior corner. The second tergite extends much below its level and is flattened or also somewhat excavated on anterior half.

The antennae are very short. Head smooth and shining. Sulcus distinct; interrupted near level of antennae.

Anal scutum shining; crossed toward caudal region by two or three weak wrinkles; narrowly rounded caudally. Much exceeded by the anal valves which are compressed.

The general color of the type is somewhat ferruginous. The somites are banded with black, or a somewhat olivaceous black, this dark color occurring along the anterior border and not extending back so far as the suture. Anal scutum and valves somewhat olivaceous black. Collum and head somewhat brownish ferruginous. Legs ferruginous.

It is distinguished in having the upper branch of the posterior gonopods lying close against the edge of the lower branch, long and very slender.

Length about 56 mm.; width 5 mm.

101. RHINOCRICUS GUADELOUPENSIS, sp. nov.

Type.— M. C. Z. 4,346. *Paratype.*— M. C. Z. 4,370. Guadeloupe: Soufriere, 1914. G. K. Noble.

This species resembles the Jamaican *R. holomelanus* in its uniform black color and in its general structure. Aside from its smaller size, however, it differs in numerous details. The legs are brown, in part of dilute ferruginous cast. The collum is distinctly margined below and a short distance up the anterior border; the surface is finely, weakly coriarious. The segmental sutures are very weak over the sides and obscure or missing above. No second suture. Segments in general smooth and shining above. Scobina extending farther caudad than in *R. holomelanus*, reaching to the twenty-ninth or thirtieth segment. Anal scutum obtusely angular with angle rounded; much surpassed by the valves which protrude strongly convexly.

Number of segments, forty-six or forty-seven.

Length, up to 80 mm.

102. RHINOCRICUS HOLOMELANUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 492.[1]

Habitat.— JAMAICA[1]: Liguanea Plain (C. T. Brues), near Port Antonio (A. E. Wight), Kingston (T. Barbour), Mandeville (T. Barbour), Bath (O. Bangs).

103. RHINOCRICUS CHAZALIEI Brolemann.

Mem. Zool. soc. France, 1900, **13**, p. 93, pl. 6, f. 8–13.[1]

Habitat.— MARTINIQUE (De Dalmas).[1]

104. RHINOCRICUS LIPARUS, sp. nov.

Type.— M. C. Z. 4,355. *Paratypes.*— M. C. Z. 4,356. Martinique: Mont Rouge, February 3, 1879. Samuel Garman.

This species is a proportionately exceptionally stout form composed of only forty-one or forty-two somites. The sulcus of the somites is deep and sharply defined entirely across the dorsum. The longitudinal sulcus just above the pore is also deeply impressed. The second tergite extends below the collum. The collum is widely rounded below and is margined laterally and up along the anterior corner; on each side it is marked with a fine but clearly defined longitudinal sulcus extending across the plate at the level of the eye, this being ordinarily curved by a vertical sulcus in front of the middle of plate and another one behind the middle. Eyes three and a fourth or more their longest diameter apart; ocelli thirty to forty-five in mostly even series, less commonly in six or eight. The vertigial sulcus weak. Antennae very short, sensory cones, numerous. Scobina present caudad to the thirty-fifth segment. Anal valves strongly compressed, much exceeding the scutum which is angular but narrowly rounded behind. Median plate of anterior gonopods of male strongly narrowed distad with sides distally concave, proximally convex and more strongly diverging, not straight as in *R. chazaliei*. Outer distal division of posterior gonopods thin, broadly clavately widened, distal margin strongly convex and incised toward the ends, thus bearing a tooth at each end; inner process shorter than the outer, slender and distally acute, not lamellate. The general color is bluish black. The somites tend to ferruginous in a narrower stripe along caudal border and are often but not always paler low on the sides than above. Labrum ferruginous, the head elsewhere ordinarily dark, with above between the eyes a deeper black subquadrate area with the angles extended sublaterad in acutely pointed processes or lines. Anal scutum and valves typically blue-black, narrowly margined caudally with pale. Legs yellowish to ferruginous.

Length up to about 55 mm.; diameter up to 5.2 mm.

105. Rhinocricus solitarius Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 496, pl. 38, f. 6.[1]

Habitat.— Jamaica (T. D. A. Cockerell).[1]

106. Rhinocricus parvior, sp. nov.

Type.— M. C. Z. 4,357. *Paratypes.*— M. C. Z. 4,358. Jamaica: Liguanea Plain, 1911, C. T. Brues.

In coloration and general appearance resembling *R. mandevillei* but, aside from the obviously smaller size, it differs in various details, important among which is the presence of scobina. The posterior borders of the somites are flavous only part way to the suture instead of all the way. The suture is dorsally weaker. The anterior portion of somites of more deep color. The suture is curved distinctly away from the pore (*i. e.,* the convexity is caudad). Striae only below, extending much less high up than in *R. mandevillei.*

Number of somites, forty.

Length near 29 mm.; width, 3.2 mm.

107. RHINOCRICUS FURCIANUS, sp. nov.

Type.— M. C. Z. 4,359. *Paratype.*— M. C. Z. 4,360. Haiti: Furcy. W. M. Mann.

A small species like the Jamaican *R. solitarius* which it resembles in structure. It is like that species in having but forty-three or forty-four segments. It differs in having the second tergite extended much below the collum and not flattened or excavated below. The anterior portion of the somites is not obviously transversely striolate, and the longitudinal striae below and in front of the sulcus are strictly longitudinal like those caudad of the suture, not directed obliquely upwards as in *R. solitarius.* The pore is in line with the suture which curves about it. The suture disappears above in a slight or obsolete furrow as in *R. solitarius.* Anal valves not at all or but very slightly compressed, not at all margined, exceeding the anal scutum which is smooth and shining like the valves.

The head is light chestnut-brown with a black mark on the face something in form like an inverted Y. Collum colored like the head excepting a black band along the anterior border. Anal scutum and valves shining black. Other segments in front of the suture black, including numerous minute light dots on each side below level of pore which are evident under magnification; behind the suture light brown or somewhat ferruginous with a narrow stripe along the posterior border above the level of the pores a brighter yellow or nearly white.

Number of segments, forty-three or forty-four.

Length, about 34 mm.; width, 3.3. mm.

108. RHINOCRICUS DOMINGENSIS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 495.[1]
Julus haitensis Saussure (non Gervais), Mém. Soc. phys. hist. nat., 1860, **15**, p. 363.

Habitat.— SANTO DOMINGO (HAITI).[1]

109. RHINOCRICUS MALTZANI Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 495, pl. 38, f. 5–5b.[1]

Habitat.— HAITI: Furcy, Grand Riviere, Milot, Jacmel. (W. M. Mann). SANTO DOMINGO: Cape Haitïen.[1]

110. RHINOCRICUS HAITENSIS (Gervais).

Julus haitensis Gervais, Ins. Apter., 1847, **4**, p. 191.[1]

Habitat.— SANTO DOMINGO (HAITI).[1]

111. RHINOCRICUS SUPRENANS sp. nov.

Type.— M. C. Z. 4,699. *Paratypes.*— M. C. Z. 4,700. Cuba: Baracoa. W. O. Crosby.

A species evidently close to *R. duvernoyi*, another similarly large Cuban species. The present form has a strongly marked color-pattern at once differentiating it from *R. duvernoyi* which is ordinarily shining brown. It is deep olive-black with the caudal borders of the annuli ferruginous, the light band very narrow; the collum similarly bordered with ferruginous all the way around. Legs and antennae olivaceous.

The collum is rounded below; it is notched on caudal side above the lateral end; not striate; failing much of attaining the lower margin of the second tergite which is not excavated.

A marked difference from *R. duvernoyi* is that, whereas in the latter the suture is very distinct throughout, in *R. suprenans* the suture is obscure above and is weak even laterally.

Number of segments forty-six or forty-seven (fifty or more in *R. duvernoyi*).

Length up to 180 mm.; width 16 mm.

112. RHINOCRICUS DUVERNOYI Karsch.

Zeits. naturwiss., 1881, sev. 3, 6, p. 77.[1]

Habitat.— CUBA:[1] Santiago de las Vegas (C. F. Baker), Guantanamo (T. Barbour), Pinar del Rio (T. Barbour).

113. RHINOCRICUS CURTIOR, sp. nov.

Type.— M. C. Z. 4,371. *Paratypes.*— M. C. Z. 4,372. Haiti: Grand Riviere. W. M. Mann.

Apparently related to *R. solitarius* Poc. It differs in coloration. The collum, last scutum, and anal valves are black, all narrowly bordered with ferruginous. Segments in front of suture blackish brown, the dark color extending caudad of the suture dorsally and the stripe narrowing ventrad to a point below middle; the segments elsewhere more or less ferruginous. Head with vertex dusky, a thick black mark bifurcate below extending ventrad from vertex; clypeus ferruginous.

Eyes about four times their diameter apart.

Second tergite not flattened or excavated below.

Unlike *R. solitarius* the suture is deep and very sharply defined entirely across the dorsum.

Segments forty-eight or forty-nine as against forty-four in *R. solitarius.*

Length near 38 mm.; width, 4.5 mm.

114. RHINOCRICUS HETEROSCOPUS, sp. nov.

Type.— M. C. Z. 4,373. *Paratype.*— M. C. Z. 4,374. Jamaica: Liguanea Plain, 1911. C. T. Brues.

Similar in general structure to *R. solitarius.* Differing in color in having a mid-dorsal series of transverse black stripes, each of which is broadly trapeziform and occupies the space in front of the suture. On each side of the black marks a longitudinal reddish or ferruginous band. Below this on each somite a black stripe in front of suture which near the pore occupies the entire space between suture and anterior margin but narrows ventrad leaving a caudal ferruginous border. Anal scutum black. Collum mostly obscure ferruginous, darker along anterior border. Legs and antennae ferruginous.

Collum broadly rounded laterally; distinctly margined. Second somite extending much below it, not flattened or excavated as in *R. solitarius.* Sutures single, becoming obscure dorsally in anterior and middle region of body especially.

Anal scutum caudally rounded, much exceeded by the anal valves.

Median plate of male gonopods with sides nearly evenly concave, not sinuate as in *R. solitarius*, distally subacute, not widely rounded. The inner process with the two distal prongs long and slender.

Number of somites, forty-eight.

Length (male type) near 37 mm.; width 3.3 mm.

115. RHINOCRICUS NIGRESCENS, sp. nov.

Type.— M. C. Z. 4,375. *Paratypes.*— M. C. Z. 4,376. Haiti: Furcy. W. M. Mann.

Apparently near *R. solitarius* but differing from this and closely allied species in having the body not distinctly banded, the color being a nearly uniform shining brownish black, excepting for a number of small pale dots visible under the legs over the anterior region of each somite, and obscurely lighter caudal border below pores. In some specimens, however, the caudal border of each somite below the longitudinal sulcus at level of pore is bright, white to ferruginous, the light stripe being narrow. The collum is lighter over the median region, but the border all around is deep black, the anterior black band widest. Anal scutum and valves deep shining black. Legs ferruginous.

Collum distinctly margined along the anteroinferior corner. Extending ventrad to near the lower border of the second tergite, the latter being flattened or a little excavated below.

The sutures obscure or essentially absent above; also weak laterally excepting low down on the sides.

Anal scutum caudally narrowly rounded, not free, a little surpassed by the valves which are evenly convex, not at all compressed or margined.

Number of segments, forty-eight.

Length near 34 mm.; width, 3.1 mm.

116. Rhinocricus socius, sp. nov.

Type.— M. C. Z. 4,377. *Paratypes.*— M. C. Z. 4,378. Grenada: Grand Etang. Roland Thaxter.

Allied in general structure to *R. solitarius* of Jamaica but readily distinguished by differences in the male gonopods. The median plate is distally very acute, not widely rounded as in *R. solitarius*, and the sides are not sinuate as in that species. The intermediate (posterior gonopods) processes in the type protrude beyond the other pieces; each at the tip is bifurcate with one branch expanded at distal end into a transparent piece with double curved or sinuate distal margin and the other slender, distally sinuate or somewhat apically coiled and acute, lying against the tip of the other which it equals in length.

Color above shining black. Each segment on the sides with caudal border brown, the brown stripe widening ventrad and above the feet often embracing all or nearly all of the segment. Legs flavous to light ferruginous. Anal scutum not pale caudally.

Sulcus on head continuous across venter and down the median line of face but weaker and sometimes in part nearly obliterated at level of antennal sockets. Collum widely rounded on each side; narrowly marginate laterally and around the anterior corner; not striate. Second tergite extending well below the first about the lower end of which it curves to near its middle, not at all flattened below. Segments with no trace of a second suture, and the ordinary one usually weak or obsolete dorsally. Surface of segments in general smooth and shining. Anal scutum caudally rounded, smooth and shining, exceeded by the anal valves. Scobina present, extending much behind middle of body, to about the forty-third segment.

Number of segments, forty-seven.

Length to near 54 mm.; diameter to 4.8 mm. (Female).

117. Rhinocricus gracilipes Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 71.[1]

Habitat.— Cuba.[1]

118. Rhinocricus grenadensis Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 498, pl. 38, f. 11.[1]

Habitat.— Grenada (H. H. Smith).[1]

119. RHINOCRICUS ARBOREUS (Saussure).

Linnaea ent., 1859, **13**, p. 331.[1]
Spirobolus (*Rhinocricus*) *arboreus* Karsch, Zeits. naturwiss., 1881, ser. 3, **6**, p. 8.[2]
Rhinocricus arboreus Pocock, Journ. Linn. soc. London, 1894, **24**, p. 493, pl 38, f. 4;[3] Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 569.[4]

Habitat.— PORTO RICO:[2] Rio Piedras (R. Catton). CULEBRA (W. M. Wheeler).[4] ST. THOMAS;[1, 3] (Hassler Exped.). SANTA CRUZ [St. Croix] (A. Newton).[3] ANTIGUA.[3]

120. RHINOCRICUS ARBOREUS GUNDLACHI Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 8;[1] Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 569.[2]

Habitat.— PORTO RICO:[1] Vega Baja (W. M. Wheeler),[2] Ribonito (R. T. Cotton).

121. RHINOCRICUS ARBOREUS KRUGII Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 8.[1]

Habitat.— PORTO RICO.[1]

122. RHINOCRICUS MACROPUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 493,[1] pl. 38, f. 3.

Habitat.— ST. VINCENT (H. H. Smith).[1]

123. RHINOCRICUS LEPTOPUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 503.[1]

Habitat.— ST. LUCIA (G. A. Ramage).[1]

124. Rhinocricus barbouri, sp. nov.

Type.— M. C. Z. 4,383. Isle of Pines: Sierra de Caballos. T. Barbour.

A large species much suggesting in size, coloration, arrangement, and form of scobina *R. duvernoyi* of Cuba. It is similarly very dark, almost blackish brown with the caudal borders deepest. The anal valves and scutum are concolorous instead of being abruptly and obviously lighter excepting the dark tip as in specimens of *R. duvernoyi* studied. The new form is at once separated from the Cuban species by its strongly marked sculpturing, giving it a rougher, less shining appearance, and especially by the presence of a second deep suture in front of the ordinary one. The lateral ends of the collum are narrower. Also the collum shows a deep transverse sulcus in front of the caudal margin, this curving forward below on each side to middle of plate. The head shows on the lower part of the frons a conspicuous depression from the edges of which radiate short impressed lines. The apical portion of the anal scutum is depressed and more strongly set off from the basal part and at the same time is more roughened than in *R. duvernoyi.*

Number of segments, fifty-two.

Length near 142 mm.; width, 14.5 mm.

125. Rhinocricus thomasianus, sp. nov.

Type.— M. C. Z. 4,384. ♂. St. Thomas. Hassler Exped.

Similar in size and in having a second segmental suture in front of the first one to *R. barbouri*. From that species readily distinguished in the much smoother surface. It lacks the transverse sulcus on the collum present in *R. barbouri* though presenting in front of the position of the latter on each side a wider shallow transverse depression. The collum is more broadly rounded below at each lateral end; distinctly margined laterally and for a short distance inferiorly in front. Lacking the pit-like depression on the front of the head present in *R. barbouri.* The tip of the anal scutum, obviously exceeded by the anal valves, is not abruptly depressed or set off from the proximal region. Scobina extending to within a few segments of caudal end, thus differing from *R. barbouri;* very deep. The general color of the type at present is light brown; the caudal margin of segments more reddish, somewhat chestnut to ferruginous. A series of small dark dots along each side corresponding to the pores.

Number of segments, fifty-two.

Length about 145 mm.; width, 13.5 mm.

126. RHINOCRICUS MARTINIQUENSIS, sp. nov.

Type.— M. C. Z. 4,411. *Paratype.*— M. C. Z. 4,385. Martinique: Mont Rouge. S. Garman, 1879.

This species is separated from the Dominican *R. leucostigma* with considerable doubt and may ultimately have to be merged with that form. It agrees with the latter quite closely in structure and coloration. It presents the two well-defined sulci on the somites with the anterior of these taking its origin well below the pore and the three longitudinal rows of flavous spots as in *R. leucostigma*. The anal valves are in most cases wholly ferruginous but may be in part dusky. The anal scutum is bordered posteriorly by ferruginous, the extent of this color varying. Perhaps the most important difference noted is that in the Martinique form the anal tergite, while sometimes slightly free at the tip, is in all cases much exceeded by the strongly protruding anal valves, whereas in *R. leucostigma*, according to Pocock's statement, the tergite is "produced into an acutely angular, blunt process, which just surpasses the valves." Typically the collum is crossed longitudinally at the level of the eye by a sulcus which in turn is crossed by two vertical sulci as in *R. liparus*. Legs ferruginous. Antennae the same or brown.

Number of segments up to forty-seven.

Length up to 45 mm.; diameter to 5 mm.

127. RHINOCRICUS LEUCOSTIGMA Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 500, pl. 38, f. 8.[1]

Rhinocricus paraensis Pocock (non Humb. & Sauss.), Ann. mag. nat. hist., 1888, ser. 6, **2**, p. 479.

Habitat.— ST. LUCIA (G. A. Ramage).[1]

128. RHINOCRICUS MONILICORNIS (Porat).

Spirobolus monilicornis Porat, Bih. Svensk. vet.-akad. Handl., 1876, **4**, no. 7, p. 31.

Rhinocricus monilicornis Pocock, Journ. Linn. soc. London, 1894, **24**, p. 499.[1]

Habitat.— HAITI: Grand Riviere (W. M. Mann). SANTO DOMINGO: Cape Haitien.[1] BARBADOS (H. W. Feilden).[1] TRINIDAD: Port of Spain, Esperanza Sugar Estate (R. Thaxter). TOBAGO: Milford Bay, Richmond Bay, King Bay, Plymouth, Scarboro (H. L. Clark).

129. RHINOCRICUS JUXTUS, sp. nov.

Type.—M. C. Z. 4,397. Grenada: Grand Etang. Roland Thaxter. *Paratypes.*— M. C. Z. 4,398–4,401. Grenada: Arima, Verdant Vale, St. Georges. R. Thaxter.

This species is nearest *R. consociatus* from Union Island; but it is a larger species, the length being up to 60 mm., with diameter 5.2 mm., instead of only up to 35 mm. with maximum diameter 3 mm. The number of segments is forty-seven or forty-eight instead of forty-four. The two sutures are dorsally complete and distinct from the third to the penult segment inclusive; on the second somite the posterior sulcus is almost obliterated and the anterior one is interrupted at frequent intervals. The collum is much exceeded by the second tergite which curves below it ventrally and fits against its edge. Collum distinctly margined below and in front excepting the dorsal region. A large shallow depression on lower part of frons; toward the middle of this depression a pair of smaller pits across and ectad from each of which extend two distinct sulci. The tip of the anal scutum is free but does not exceed the valves. General color, when dry, olive-black; in alcohol more green, especially above toward anterior border. Caudal border of each ordinary segment flavoferruginous, the light band above extending somewhat less than half way to the suture but widening moderately below on each side. The collum narrowly bordered all around by the flavoferruginous. Tip of scutum weakly light-colored. Legs ferruginous to chestnut.

130. RHINOCRICUS CONSOCIATUS Pocock.

Journ. Linn. soc. Zool., 1894, **24**, p. 500, p. 38, f. 7.[1]

Habitat.— UNION.[1]

130a. RHINOCRICUS TOBAGOENSIS, sp. nov.

Type.— M. C. Z. 4,402. *Paratypes.*— M. C. Z. 4,403. Tobago: near Milford Bay, March, April, 1916. H. L. Clark.

This species is near *R. consociatus* from Union Island, and *R. juxtus* from Grenada. It is a much smaller species than the latter, has fewer segments, and differs in color-pattern as well as in various structural details. It agrees with *R. consociatus* in size. It differs clearly in the form of the male gonopods, the median plate, for example, being differently formed, its sides convex proximally and incurved distally instead of straight throughout. The inner (posterior) piece projects distally beyond the others; it presents two slender distal prongs of which one is expanded and narrowly laminate distally.

In color it differs decidedly from both the species mentioned. The general ground color is brown; each segment dorsally is narrowly bordered with black, the stripe narrowing laterad on each side and disappearing in a point near the level of the pore. Below the level of the pore in front of the suture and extending a varying distance dorsad, the somites are dusky to nearly black, embracing lighter areolations below. The anal scutum dark with caudal tip ferruginous and a narrow light border below on each side. Anal valves dark. Legs ferruginous.

Sulcus of head sharply defined, scarcely interrupted. Antennae very short; sensory cones numerous.

Second tergite extending much below the collum, not flattened or excavated. On somites, excepting first and last, two sutures present, these sharply defined entirely across dorsum. The posterior suture sharply bent about the pore. The anterior one taking its origin near the level of the pore excepting in the most anterior segments on which it extends below that level.

The anal scutum free for a short distance at caudal end but not surpassing the valves, either equalling them or falling a little short.

Number of segments forty-six.

Length, up to 35 mm.; width, to 3 mm.

131. RHINOCRICUS ANGUINUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 502.[1]

Habitat.— ST. LUCIA (G. A. Ramage).[1]

132. RHINOCRICUS GRAMMOSTICTUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 501.[1]

Habitat.— ST. LUCIA (G. A. Ramage).[1]

132a. RHINOCRICUS MIMETICUS, sp. nov.

Type.— M. C. Z. 4,404. Tobago: near Plymouth, April, 1916. H. L. Clark.

Like *R. vincenti* in having two sutures of which the posterior one is obsolete across the dorsum but easily distinguished from that species in having the anal scutum surpassing the valves. In coloration suggesting *R. monilicornis.* On each ordinary somite there is a dark encircling stripe just in front of the posterior suture, this band narrowing down each side and ending some distance from the legs. Dorsally, there is a narrow, dark stripe in front of the caudal border, and on some segments, especially in posterior region, a dark caudal mark below the level of the pore. The collum is dark, narrowly margined with pale. Head dark. Anal valves dark. The anal scutum dark proximally, becoming lighter, flavoferruginous distally. Legs ferruginous.

Collum weakly margined below and a short distance up the front. Widely rounded below. Much surpassed ventrally by the second tergite.

Posterior suture conspicuously angled at level of pore. Anterior suture in anterior region arising below pore, elsewhere near its level, sharply defined throughout its length, the posterior one obsolete dorsally.

Anal scutum conspicuously produced, exceeding the valves, distally strongly rounded. Anal valves mesally elevated and compressed, but without margining sulci.

Number of segments, forty-seven.

Length, near 34 mm.; width, 2.6 mm.

133. RHINOCRICUS VINCENTI Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 503, pl. 38, f. 10.[1]

Habitat.— ST. VINCENT (H. H. Smith).[1]

134. RHINOCRICUS BRUESI, sp. nov.

Type.— M. C. Z. 4,405. Jamaica. C. T. Brues.

This species is characterized in having two sutures both of which on most segments are obliterated dorsally, the two being laterally about equally developed.

Each segment with an encircling median band which is brownish in color or sulcus across the dorsum in posterior region a distinctly bluish tinge, the band becoming paler down each side where it is areolated with small light dots. Anterior and posterior borders light ferruginous. Last tergite dark, anal valves ferruginous.

Collum laterally widely rounded, narrowly margined. Second somite extending much below collum, not excavated.

Scobina well developed. Pores back of middle of somites. Suture curving opposite pore. Anterior beginning a little above the level of the pore.

Last tergite much exceeded by the valves.

Number of segments, forty-eight.

Length, near 34 mm.; width, 3 mm.

135. RHINOCRICUS COCKERELLI Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 505.[1]

Habitat.— JAMAICA: Mandeville (T. D. A. Cockerell),[1] Cinchona, Liguanea Plain (C. T. Brues).

136. RHINOCRICUS SABULOSUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 504, pl. 38, f. 12.[1]

Habitat.— JAMAICA: Mandeville (T. D. A. Cockerell).[1]

NESOBOLUS, gen. nov.

In this genus the gonopods differ from those of Rhinocricus in having the two prongs of the posterior gonopods both slender much as in Dinematocricus, a genus abundant in the East Indies, etc., with the ventral, or principal one, much the longer and drawn out to a fine tip, and the shorter one more blade-like, and bearing the seminiferous duct which in Dinematocricus opens between the two branches.

Antennae short; sensory cones four.

Collum broad and rounded laterally.

Pores in front of suture; beginning on sixth somite. Scobina present.

Genotype.— *N. toroanus,* sp. nov.

137. NESOBOLUS TOROANUS, sp. nov.

Type.— M. C. Z. 4,412. Cuba: Guantanamo. C. T. Ramsden. *Paratypes.*— M. C. Z. 4,413, 4,420–4,422. Cuba: Mt. Toro, Nimfilas, Ramona el Mono, San Felipe, Los Hondones, Belona. C. T. Ramsden.

Color behind suture on a typical somite is dark brown, the color near and below the level of the pore is lighter from the inclusion of aggregations of numerous light dots as seen under the lens, a narrow marginal light stripe also often evident across the dorsum. Collum with a blackish stripe across anterior border and a narrower one along the caudal, the median area of the plate being covered with a network of dark lines. Anal scutum and valves black, the former narrowly margined with flavous or light ferruginous and embracing minute light dots proximally. Legs flavous or light ferruginous.

Eyes in a subcircular to somewhat triangular area, about twenty-five in number in five series.

Collum margined laterally and around and just above the anterior corner. Second tergite extending below it but more or less flattened beneath. Suture of segments strongly marked throughout, single, gently sinuate at level of pore.

Anal valves much exceeding the last tergite; strongly convex, not compressed, nor margined.

In this species the median plate of the male gonopods is inversely T-shaped, the median piece being long, slender, and parallel; sides distally subacutely narrowed, and in the type-species constricted proximally; the paired outer (anterior) gonopods are almost wholly exposed in front view. The posterior (inner) gonopods are slender, and distally bifurcate with the prongs long and slender, the upper seminiferous one short and slenderly blade-like, distally curved and subacute, the other very much longer and running out to a fine point.

Number of segments, forty-seven to forty-nine.

Length up to about 43 mm.; width, to 3 mm.

138. THYROPROCTUS TOWNSENDI Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 506, pl. 37, f. 6–6c.[1]

Habitat.— JAMAICA. (T. Townsend).[1]

139. THYROPROCTUS CINCHONIANUS, sp. nov.

Type.— M. C. Z. 4,416. *Paratypes.*— M. C. Z. 4,417. Jamaica: Cinchona, 5,000 feet. January, 1912. C. T. Brues.

This, the second known species of this interesting genus, may be distinguished from *T. townsendi* at once by the strikingly different coloration. It presents along the mid-dorsum a continuous black band composed of rather narrow trapezoidal marks, one on each segment. Each side of the median black stripe there is a series of smaller ferruginous or red dots while below these the side is dark brown to black in front of the suture, this region embracing numerous small light dots or areolations, while the color caudad of the suture is solid but lighter, commonly ferruginous. There is a black mark between the eyes and extending down the labrum suggesting that on the face of *Rhinocricus cockerelli*. Legs flavous. Anal tergite black excepting for a narrow flavous border. Anal valves also black excepting narrow flavous margin. Collum with a black mark on anterior border.

The head differs from that of *T. townsendi* in having the sulcus clearly marked and extending to the margin of the labrum excepting for an interruption near the level of the antennae.

Collum weakly margined below, not attaining lower edge of second tergite. With a single stria on each side at level of eye.

Posterior suture obscure above pore; the anterior suture very deep, curving widely opposite the pore considerably below which it takes its origin as in *T. townsendi*. Posterior border of segments elevated as in that species.

The anal scutum convexly though only rather weakly bowed caudad, being obviously longer at the middle than at the sides. Anal sternite strongly elongate transversely, thickened, the anterior and posterior margins parallel.

Number of segments, thirty-seven or thirty-eight.

Length, 30 mm.; width, 3.2 mm.

CUBOBOLUS, gen. nov.

Unlike Microspirobolus and Cairibolus the median plate in the male gonopods is relatively narrow, and is distally acute or very narrowly rounded, leaving the paired gonopods much exposed at the sides in front view. The anterior pieces of the first gonopods are broad and bifurcate distally, the anterior branch wide and thin, the posterior extending mesad behind the telopodite which it thus embraces. The inner or posterior gonopod distally expanded into a plate-like body which is distally excised and bears above the notch a thin subacute process; from near the base of the expanded end piece arises a slender, distally acute, process or style which lies close to the end-piece and terminates near the tip of the latter.

Articles of antennae all short, none specially enlarged; sensory cones four in number. Labial pores 2 + 2.

Pores beginning on sixth somite, situated in front of sutures. No scobina.

Anal valves not compressed or margined.

Genotype.— *C. beliganus,* sp. nov.

140. CUBOBOLUS BELIGANUS, sp. nov.

Type.— M. C. Z. 4,418. *Paratype.*— M. C. Z. 4,419. Cuba: Oriente Province, Belig, near Cape Cruz. O. Tollin.

General color brownish, when in full color chestnut or red caudad of the suture on each somite, and the area in front of the suture embracing numerous light dots as viewed under the lens. The anal scutum and valves in the type are a dull dark yellowish color. The labrum light below excepting a narrow marginal stripe below which is dark. Head elsewhere darker excepting across vertex at base. Legs flavous or light brown.

Ocelli about thirty-two in number in each eye, these in six transverse and somewhat curved series.

Collum widely rounded laterally, only vaguely margined below. Second tergite extending much below it, not flattened or excavated beneath.

The segmental sutures deep and distinct entirely across dorsum, either straight or but slightly curved at level of pore, the latter close to the longitudinal suture which is distinct.

Anal segment long.

Anal scutum exceeded by the valves, which bulge convexly caudad and are evenly convex, not margined or compressed, smooth.

Number of somites, forty-four.

Length, 45 mm.; width, 4 mm., nearly.

141. MICROSPIROBOLUS MARMORATUS Silvestri.

Bull. Amer. mus. nat. hist., 1908, **24**, p. 10, f. VI (1–6).[1]

Habitat.— PORTO RICO: Utuado (W. M. Wheeler).[1]

142. MICROSPIROBOLUS INSULARIS Silvestri.

Bull. Amer. mus. nat. hist., 1908, **24**, p. 572, f. VII (1–2).[1]

Habitat.— PORTO RICO: Utuado (W. M. Wheeler).[1]

143. MICROSPIROBOLUS BELONANUS, sp. nov.

Type.— M. C. Z. 4,423. *Paratypes.*— M. C. Z. 4,424, 4,425. Cuba: Belona Oriente. C. T. Ramsden.

Most of the somites are black above in a band at middle extending from anterior nearly to caudal border but narrowing down the side to level of pore; the caudal region at middle yellow but just above pore on each side reddish; region immediately below pore dark, the sides below this light, dominantly yellowish or dilute orange. First tergite yellow in a band across anterior border and in a narrower band along caudal border. Head black above level of antennae, the dark above eyes and in a smaller area mesoventrad of each eye in a close network over a yellow ground, elsewhere solid; below antennae yellowish.

Ocelli strongly developed; arranged in five transverse series, *e. g.*, 8, 8, 7, 5, 4, a total of thirty-two. Antennae short, articles short, the second and third longest, the sixth much thickened above a slender base; sensory cones four. Labial pits 4 + 4.

Collum or first tergite narrowed considerably at each side but much less so than in Trigoniulus, the lower end strongly rounded; margined laterally and in front.

Repugnatorial pores in line with suture which closely embraces it; beginning on sixth somite. Suture obsolete across dorsum. Scobina none.

Anal scutum not exceeding the valves, though sometimes free at apex; caudally somewhat narrowly but strongly rounded. Anal valves mesally margined.

In the gonopods of the male the median triangular plate is distally broadly rounded, apex not mesally truly incised.

Telopodites of first gonopods equalling this in length. The posterior, seminiferous, gonopods extending normally conspicuously beyond these, each in form of very broad thin plate with edges in subvertical plane; the distal region expanded and bearing two slender, acute, and widely diverging prongs the lower of which, the seminiferous, is curved at tip; above the lower branch a distally rounded lobe which ends at the beginning of the curve.

Number of segments, forty-six.

Length, about 25 mm.; width, 2.1 mm.

144. MICROSPIROBOLUS FONTIS, sp. nov.

Type.— M. C. Z. 4,426. Cuba: San Diego de los Baños, April, 1900. Palmer and Riley, April, 1900.

A stouter species than *M. belonanus* from which it differs conspicuously in its darker color and the absence of the series of red spots. The general color is dark brown with the segments bordered equally with pale. Anal valves and scutum dark. Collum with a dark transverse band behind the pale anterior border.

The species is characterized by exceptionally small eyes, in which the ocelli are few, small and pale, contrasting strongly with the eyes, *e. g.*, of *M. belonanus*.

The collum extends a little below the level of the second tergite.

The segments are considerably constricted, the caudal region more elevated. At the bottom of the constriction of segments especially in anterior region a sharply defined encircling sulcus.

Anal valves exceeding the scutum.

Number of segments forty-one.

145. MICROSPIROBOLUS LINEATUS, sp. nov.

Type.— M. C. Z. 4,427. *Paratypes.*— M. C. Z. 4,428. Haiti: Diquini. W. M. Mann.

This form is black along the sides with a continuous median dorsal stripe of the same color which may be at intervals constricted so as to present a beaded appearance but in no observed case broken into distinct dots. Each side of the mid-dorsal black stripe a bright yellow or orange stripe. Lower part of sides and venter also yellow or orange. First two segments completely yellow or orange as is also the head excepting above the level of the antennae where it is black.

Head smooth. Pores 2 + 2. Eyes widely separated; ocelli arranged in five or six transverse series, *e. g.*, 6 + 5 + 5 + 4 + 2 and 4 + 5 + 6 + 5 + 3 + 2.

Lower margin of collum on each side substraight, but corners rounded; lower part of anterior border and ventral border margined. Not striate. Transverse sulci complete dorsally though weaker than laterally and ventrally. Scobina none.

Anal scutum subtriangularly extended but strongly rounded caudally. Anal valves mesally rather weakly margined.

Number of segments, thirty-eight to forty-four.

Length, (female) 22 mm.; width, 2.2 mm. Male smaller.

CAIRIBOLUS, gen. nov.

Resembling Microspirobolus. Median plate of male gonopods similarly elongate and broadly expanded distally, but distal margin truncate, not mesally incised. Anterior gonopods more slender, particularly the telopodites. Inner or posterior gonopod flattened and plate-like as in the other genus but wholly lacking the two prongs or hastate processes, being merely narrowly incised on the mesal side with at most a short tooth at upper angle of incision. Labral pores only 2 + 2. Collum narrowed at the sides. Scobina none. Anal valves strongly marginate, the elevated borders limited by deep and wide grooves.

Type.— *C. antonianus,* sp. nov.

146. Cairibolus antonianus, sp. nov.

Type.— M. C. Z. 4,429. Jamaica: Port Antonio. In cocoanut tree stump, November 24, 1905. A. E. Wight. Jamaica: Kingston, 1909. T. Barbour. *Paratypes.*— M. C. Z. 4,430–4,432.

A dark species, the somites being black or nearly so excepting a narrow ferruginous band along the caudal border, this widening ventrad. Legs and antennae ferruginous.

Head essentially smooth but under magnification seen to be very minutely impressed punctate and shortly lineate. Sulcus evident across vertex and again below level of antennae. Eyes separated by more than their diameter. Antennae very short.

Collum conspicuously narrowed down the sides, the sides below being excavated in front. Not attaining lower edge of second tergite. Margined distinctly lateral, and in front except mesally. Not striate.

Other segments strongly striate beneath. Pore in front of suture or at times nearly in line with it. The latter distinct across dorsum, strongly impressed punctate. Surface otherwise essentially smooth.

Anal scutum caudally obtusely triangular but apex narrowly rounded, a little exceeded by the valves. Anal valves strongly margined, convex.

Number of somites, forty-eight.

Length up to about 45 mm.; width to 3.1 mm.

147. Cairibolus leiosuturus, sp. nov.

Type.— M. C. Z. 4,433. *Paratypes.*— M. C. Z. 4,434. Porto Rico.

Aside from differences in the male gonopods, such as in details of inner (posterior) processes, the narrower tongue of the median plate, and so forth, this species may be distinguished from *C. antonianus* in having the suture clear-cut and straight, not marked with a series of deep punctae, the plate elsewhere, however, being subdensely impressed punctate. The pore more distinctly removed from the suture, but the latter often weakly sinuate opposite it. The coloration is similarly dark with ferruginous caudal borders, though the ferruginous bands are usually broader and better defined and the dark portion commonly includes numerous light dots or areolations. The legs are a lighter ferruginous, almost yellow. The collum is similarly narrowed laterally but the lower corners in the male are distinctly more angular, the posterior one in particular being acute and somewhat produced caudad. The processes of the sternites in the male are similar, the fifth one bearing the two conspicuous, corneous lobes projecting forward over the fourth, but the sixth sternite obviously lower, not at all lobate or elevated into prominences.

Number of segments, fifty.

Length up to about 54 mm.; width to 3.6 mm.

148. TRIGONIULUS LUMBRICINUS (Gerstaecker).

Spirobolus lumbricinus Gerst., Gliederthier-fauna Sansibar, 1873, p. 516.
Spirobolus goësi Porath, Bih. Svensk. vet.-akad. Handl., 1876, **4**, no. 7, p. 36.[1]
Spirobolus dominicae Pocock, Ann. mag. nat. hist., 1888, ser. 6, **2**, p. 481–483, pl. 16, f. 7.[2]
Spirobolus sanctae-luciae Bollman, Proc. U. S. N. M., 1888, **11**, p. 214.[3]

Habitat.— HAITI:[2] Port au Prince, Grand Riviere, Diquini, Petionville, Emery. (W. M. Mann). PORTO RICO: Rio Piedras. (R. T. Cotton). ST. BARTHOLOMEW.[1] DOMINICA.[2] ST. LUCIA.[3] TRINIDAD: Esperanza Sugar Estate, December, 1912. R. Thaxter.

148a. TRIGONIULUS FRATER, sp. nov.

Type.— M. C. Z. 4,445. Tobago: near Richmond Bay. H. L. Clark.

A decidedly smaller species than *T. lumbricinus* from which it differs also conspicuously in color. A typical somite is encircled with a broad dark brown to blackish band in front as well as caudad of which there is a border of flavous or light brown color then becoming dilute ferruginous in the anterior region. The dark band narrows ventrad and above in the anterior part of body especially embraces light areas. Anal scutum and valves dark brown or blackish. Legs light ferruginous.

The lower wing of the collum on each side broader than in any one of the other species, not incurved on the caudal side; the margin elevated on each side and up the front well toward the dorsum; a strong longitudinal sulcus a little above the inferior end of the plate.

The surface of the somites obviously smoother than in the two species mentioned, lacking wholly or nearly so the characteristic circular and crescentic impressions.

The anal valves exceedingly strongly compressed, much more so than in *T. lumbricinus* and not narrowly margined as in *T. garmani.*

Number of segments, fifty-five.

Width, (male type) 3.1 mm.; length near or a little over 40 mm.

149. TRIGONIULUS GARMANI, sp. nov.

Type.— M. C. Z. 4,446. *Paratype.*— M. C. Z. 4,447. Martinique: Mont Rouge, February, 3, 1879. Samuel Garman.

At once distinguished from *T. lumbricinus* in its obviously smaller size and much darker color. In place of the ordinarily brick-red color of *T. lumbricinus* the present species is a dark slate-blue with the segments narrowly bordered behind with reddish. The collum is black, narrowly bordered both in front and behind with reddish. Head also dark, becoming paler toward labrum. Anal tergite and valves also blackish, narrowly margined with reddish.

The sculpturing is clearly different from that in *T. lumbricinus,* the surface caudad of the suture being much smoother while that in front is more coarsely but much less densely impressed, the impressions along to suture being of the same characteristic circular, semicircular or crescent form but elsewhere coarsely punctate or wholly lineate.

The anal scutum very nearly equals the valves. The latter, in contrast with those in *T. lumbricinus,* which are widely compressed, are narrowly and sharply margined, the margining grooves deep.

The male gonopods differ much.

Number of segments, fifty or fifty-one.

Length (female) about 38 mm.; width, 3.5 mm.; length of male near 32 mm.; width, 3 mm.

149a. TRIGONIULUS REMOTUS, sp. nov.

Type.— M. C. Z. 4,448. Swan Island, April, 1913. George Nelson.

In coloration approaching *T. frater* more closely than any one of the West Indian species. The main part of each typical somite is blackish, lighter on the sides from the inclusion of light areas; the extreme caudal margin is narrowly bordered with flavous and adjoining this is a wider annulus of brown which shows often a distinct reddish tinge and does not extend to the suture; the anterior border of the somite is flavous, this color encroaching a variable distance caudad upon the black and more so above than laterally. The anal scutum black excepting a very narrow stripe on the caudal margin and the anal valves also black. The head is dorsally crossed with a close network in black, a similarly marked area also existing mesad of the lower part of each eye; elsewhere the head is dusky or black excepting the labrum. Legs and antennae flavous.

The somites caudad of the suture are essentially smooth. In front of the suture above they are sparsely punctate while on the sides and adjacent to the furrow in which the suture lies there are the characteristic circular and semicircular, fine impressions, while away from the furrow these are only obscurely indicated. Across the dorsum in the furrow is a series of coarse punctae and impressed lines.

The collum strongly narrowed down each side as usual. Caudal margin incurved a little above the lower end. Strongly margined in front and below, the sulcus below somewhat double.

The anal valves are mesally margined but are not nearly so strongly elevated and compressed as in *T. frater*, while the margining sulcus is more distinct than in any of the other West Indian species.

In the male gonopods, aside from the important differences presented in details of the posterior pair, the median plate is at once seen to be conspicuously different from that of *T. lumbricinus*, for instead of presenting a triangular distal region this part is oblong, and distally broad and truncate or slightly convex.

Number of segments, forty-eight.

Diameter, 3 mm.

150. SPIROSTROPHUS NARESI (Pocock).

Spirobolus naresii Pocock, Ann. mag. nat. hist., 1893, ser. 6, **11**, p. 252, pl. 16, f. 4–4b.

Trigoniulus naresi Brölemann, Mem. Zool. soc. France, 1900, **13**, p. 94, pl. 6, f. 14.[1]

Habitat.— GUADELOUPE: Basse Terre, Feb. 16, 1895 (De Dalmas).[1]

This is an East Indian species and was probably introduced with timber.

NEMASOMIDAE.

150*a*. NEMASOMA TRINIDADENSE, sp. nov.

Type.— M. C. Z. 4,449. Trinidad: Guacharo Cave. "In nest material." F. W. Urich and C. B. Williams. *Paratypes.*— M. C. Z. 4,450, 4,451. Trinidad: Port of Spain. R. Thaxter.

This is a lighter colored species than the common North American species, *N. minutum*, being mostly of a dilute ferruginous brown color with some darker markings especially in the anterior region, the dark areas commonly embracing many light spots or forming a network; in some a series of small dark dots over the repugnatorial glands may be traced over the anterior region of the body.

The body is longer and proportionately more slender than in *N. minutum*. The somites are much more obviously constricted along the suture, the encircling furrow being conspicuous.

The eye-patch is more narrowly oblong, the length being subvertical. The ocelli are arranged typically in but three vertical, slightly curved series: *e. g.*, 9 + 8 + 6 to 7 + 4 + 1.

Length, up to 16 mm.

The specimens from Port of Spain (Roland Thaxter) are darker than those from the Cave.

151. JULUS CURIOSUS Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 15.[1]

In this species the repugnatorial pores lie in front of the transverse sutures and the anal tergite does not surpass the valves. Collum widely rounded. Sulci deep. Striate behind sutures, smooth in front. Pores scarcely above middle.

Number of somites forty-seven.

Length 36 mm.

Habitat.— PORTO RICO.[1]

The generic or even family position of this and the following form cannot be determined with entire certainty until the types have been restudied or the species found again. They are not congeneric.

152. JULUS CAESAR Karsch.

Zeits. naturwiss., 1881, ser. 3, **6**, p. 18.[1]

In this form the repugnatorial pores lie caudad of the transverse sutures and the caudate anal tergites surpass the valves a little. Collum angularly rounded. Segments striate on both sides of suture. Pores high above middle.

Number of segments, sixty.

Length, 70 mm.

Habitat.— PORTO RICO.[1]

CYCLODESMIDAE.

153. CYCLODESMUS PORCELLANUS Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 509, pl. 39, f. 1, 1a.[1]

Habitat.— JAMAICA.[1]

154. CYCLODESMUS HUBBARDI Cook.

Brandtia, 1896, p. 28.[1]

Habitat.— JAMAICA: Mandeville, in a "small damp cave" (H. G. Hubbard).[1]

155. CYCLODESMUS HAITIANUS, sp. nov.

Type.— M. C. Z. 4,452. Haiti: Diquini. *Paratypes.*— M. C. Z. 4,453, 4,454. Haiti: Petionville. W. M. Mann.

This is a large robust species somewhat resembling *C. porcellanus* in the character of the keels of the third segment which similarly extend forward over those of the second, but which are rather less expanded. In *C. porcellanus* the keel of the fourth somite on each side is distally acute with the anterior margin convex and the posterior slightly concave, in the present species this keel is distally conspicuously rounded and is bent caudad, showing also a slight notch on the caudal side a little proximad of the tip. The present species lacks the notches on the caudal side of the keels in the posterior region of the body, the caudal margins, on the contrary, being straight or the last few bent moderately caudad; although the last two keels show a very small and obscure notch close to the caudal angle.

Yellowish. Obscure darker marks on the sides and a darker middorsal line showing more distinctly in the caudal region.

Maximum length near 13 mm.; width, 4.8 mm.

156. CYCLODESMUS BRUESI, sp. nov.

Type.— M. C. Z. 4,455. *Paratypes.*— M. C. Z. 4,456. Jamaica: Liguanea Plain, 1911. C. T. Brues.

This is a larger and more robust species than either of the other two species known from Jamaica. It is at once separable from *C. porcellanus* in lacking the conspicuous notch in the posterior margin of the keels of the posterior portion of the body as well as very obviously in the form of the keels of the third segment, these remaining of the same length as the median portion of the tergite, not expanding and extending forwards over the keels of the preceding somite. The second keels parallel the third, the two on each side closely contiguous. The keels of the fourth somite distally strongly rounded, much less acute than in *C. porcellanus*.

The general color is yellowish, somewhat darker in an oblique area beginning at base of each keel and in a mid-dorsal line.

Length of about 12 mm.; width 3.5 mm. A paratype is larger, near 16 mm. in length.

PLATYRACHIDAE.

157. PLATYRACHUS LUCIAE Pocock.

Journ. Linn. soc. London, 1894, **24**, p. 511, pl. 39, f. 3–3d.[1]

Habitat.— ST. LUCIA: Fond de Jaques (G. A. Ramage).[1]

158. PLATYRACHUS (?) MACULATUS Bollman.

Stenoñia maculata Bollman, Proc. U. S. N. M., 1888, **11**, p. 336.[1]

Habitat.— CUBA (F. Poey).[1]

CHYTODESMIDAE.

159. DOCODESMUS VINCENTI (Pocock).

Cryptodesmus vincentii Pocock, Journ. Linn. soc. London, 1894, **24**, p. 510, pl. 39, f. 2–2d.[1]

Habitat.— ST. VINCENT (H. H. Smith).[1]

160. DOCODESMUS HAITIENSIS, sp. nov.

Type.— M. C. Z. 4,464. Haiti: Diquini. *Paratypes.*— M. C. Z. 4,465–4,470, 4,481. Haiti: Emery, Petionville, Furcy, Jacmel. W. M. Mann.

The general color of the mid-dorsal region is brown, but there is a median longitudinal light stripe of which the part pertaining to each tergite is subtriangular in outline with the apex caudad; the keels are also pale with the lateral portion transparent. The antennae and legs are light yellow.

The body in the male is typically about four times longer than the greatest width. The keels are horizontal and broad as usual; but the feet when extended laterad show beyond the margins of the keels. The first tergite has the semicircular anterior and lateral margin moderately elevated so that the border above is somewhat concave; border crossed by the usual transparent radial lines or sulci dividing it into twelve areas. The keels in general are bent moderately forward, with the anterior margin gently convex and smooth or very vaguely crenulate though the emarginations are shallow and correspond to the ends of sulci crossing the posterior border of the keel and dividing it into areas. The posterior border of the tergite between the keels is also crossed by similar sulci which are shorter and closer together, the posterior margin correspondingly but more weakly crenulate. Anterior corners of keels slightly obtuse, well rounded, the posterior corners more angular, subrectangular, in the eighteenth and nineteenth produced strongly caudad as usual, in the others in going forwards progressively less so. Lateral borders of keels divided by cross sulci as usual into areas, each of which is represented by a low convexity or crenation at the margin. On the keels of the second to sixth somites inclusive there are three lateral crenations; on the seventh four, and also four on all others excepting the eighth and eleventh. An exceedingly small repugnatorial pore is present on the usual keels (V, VII, IX, X, XII and the succeeding ones), while what appears to be the duct leading to it may be seen more distinctly in some specimens by transmitted light. The tubercles arranged as usual, those of the submedian rows and one on each side near bases of the keels being larger than the others. The last tergite is much less distinctly trilobed than in *D. vincenti*, the lateral lobes being represented by a projecting tubercle of moderate size toward the base; plate distally subtruncate, being slightly rounded.

The basal lobe of the male gonopods is very large and rounded with the processes springing from the mesal side of each and being in part concealed thereby in lateral view. The posterior process on each side is a short subcylindrical process about half as long as the anterior one and mucronate at tip; much more conspicuous than in *D. vincenti*. The anterior process is a thinner, more chitinous blade bifurcate to its base into two slender, distally acute processes of which the caudal one is weakly bent toward the tip and the anterior one, which contains the seminal duct, bent more strongly mesocaudad toward the tip. *In situ* these principal, distally geniculate, processes cross in the middle line.

Length, 16 mm.

161. Docodesmus parvior, sp. nov.

Type.— M. C. Z. 4,471. Haiti: Furcy. W. M. Mann.

This is a very much smaller form than *D. haitiensis* above described and it is also much darker brown, color nearly uniform. The keels but little lighter than the mid-dorsum. The number of crenulations on the lateral margins of the keels is as in that species; but the emarginations between the crenuli are deeper and more acute. The border of the head is more abruptly concavely depressed contiguously to the elevated median region and the free edge is more elevated. Lateral tubercles of anal tergite small, the latter not appearing trilobate. The caudolateral processes of the penult somite projecting a little mesad of caudad, thus a little converging, narrowly rounded at tip.

Length about 8.5 mm.; width, 2 mm.

162. Docodesmus grenadae, sp. nov.

Type.— M. C. Z. 4,482. *Paratypes.*— M. C. Z. 4,472, 4,473. Grenada: Grand Etang. Roland Thaxter.

This species is a much darker brown than *D. haitiensis* and lacks the median dorsal light stripe, the keels also maintaining the same dark color.

A smaller species than *D. haitiensis* but with similar relative proportions. The keels in general slightly bent forwards in the middle region, with the anterior margins straight while the posterior margins are slightly convex. The crenations on the posterior margins of the keels much more pronounced than in *D. haitiensis*, the emarginations deep. Crenations on lateral margins also stronger but the emarginations not so deep as those of the caudal margin. In the last tergite the median lobe decidedly smaller in comparison with the lateral lobes or tubercles than in *D. haitiensis*, more rounded.

In the male gonopods the basal lobes are smaller than in *D. haitiensis* and the principal processes are attached more distad. The posterior process is a mere rounded tubercle at the base of the anterior. The anterior consists on each side of two slender chitinous needles as in the preceding species. The posterior of these is much more slender, straight throughout and is shorter, the tip reaching only to near the distal geniculation of the seminiferous branch. The latter toward the distal end is geniculate as usual, with no spur such as is present in vincenti, the tip banding caudomesad and, *in situ*, crossing that of the opposite gonopod.

Length up to 12.8 mm.

162a. DOCODESMUS TRINIDADENSIS, sp. nov.

Type.— M. C. Z. 4,474. Trinidad: Port of Spain. Roland Thaxter.

This species has much the general appearance and structure of *D. grenadae;* but it is proportionately longer and has the dorsum obviously more elevated and convex, with the keels more depressed. The crenulations on the caudal margins of the keels are clearly more acute and tooth-like. The coloration is somewhat similarly dark but is more reddish, and a lighter geminate median dorsal stripe is traceable though obscure excepting between the plates proper, where it is very distinct. The last tergite has the lateral lobes proportionately much larger, with the median one short and much broader with the distal margin wide, slightly convex.

Length, about 13.2 mm.

163. CHYTODESMUS LAQUEATUS (Karsch).

Cryptodesmus laqueatus Karsch, Mitth. Münch. ent. ver., 1880, **4**, p. 142.[1]

Habitat.— CUBA.[1]

164. TRIDESMUS SECTILIS Cook.

Brandtia, 1896, p. 21.[1]

Habitat.— PORTO RICO.[1]

165. TRIDESMUS PORTORICENSIS Silvestri.

Bull. Amer. mus. nat. hist., 1908, **24**, p. 577, f. XII (1–3), XI (1–2).[1]

Habitat.— PORTO RICO: Utuado (W. M. Wheeler).[1]

166. IOMUS INCISUS Cook.

Proc. U. S. N. M., 1911, **40**, p. 458, f. 4.[1]

Habitat.— PORTO RICO: Mayaguez.[1]

167. IOMUS PLATANUS Cook.

Proc. U. S. N. M., 1911, **40**, p. 459.[1]

Habitat.— PORTO RICO: Barrio Plata.[1]

168. IOMUS OBLIQUUS Cook.

Proc. U. S. N. M., 1911, **40**, p. 460.[1]

Habitat.— PORTO RICO: near Bayamon.[1]

PYRGODESMIDAE.

169. TRESEOLOBUS CARAIBIANUS, sp. nov.

Type.— M. C. Z. 4,475. *Paratype.*— M. C. Z. 4,476. Haiti: Manneville, December, 1912. W. M. Mann.

Color brown, uniform. Head yellow, excepting the frontal region which is brown. Venter yellow, as are the antennae and legs. Body slender, with the dorsum exceptionally strongly arched, hemicylindrical, the keels depressed.

Tergites above with four longitudinal series of large tubercles forming along the dorsum four conspicuous serrate ridges, the dorsum elsewhere closely crowded with lower tubercles which are flatter and less sharply marked on the keels. All tubercles covered with numerous dark points. Median region of first tergite strongly elevated, the tubercles of the four principal rows exceptionally large; border turned up along the free margin, deeply radially furrowed, lobes ten. Anal tergite with margin divided into six lobes of which the middle one on each side is largest; dorsum with the two submedian rows of large tubercles represented by two continuous, straight edged ridges or keels. First tergite with each margin three lobed; the other non-poriferous keels with lateral margin two lobed, the single indentation occurring caudad of the middle; in the poriferous keels the caudal lobe is bifid, the lobes small, with the paler poriferous process projecting obliquely caudoectad between them at the caudolateral corner. Pores on fifth, seventh, ninth, twelfth, thirteenth, fifteenth, and sixteenth segments as usual. The caudal margin of each lateral keel proper with a single lobe between its base and the caudolateral corner lobe.

Length, 6.5 mm.; width 1.1 + mm.

170. TRESEOLOBUS GRANULOFRONS, sp. nov.

Type.— M. C. Z. 4,477. *Paratypes.*— M. C. Z. 4,478. Haiti: Jacmel, December, 1912. W. M. Mann.

This species is paler throughout than *T. caraibianus*, yellow of a weak reddish brown tinge above. The head in front and dorsally above the level of the antennal sockets distinctly tuberculate, not smooth as in the preceding species. The border of the first tergite divided by radial sulci into ten primary lobes but the caudal one on each side distinctly divided again, giving a total of twelve lobes. The other tergites bearing only the two submedian rows of stronger tubercles, the lateral one present on each side in *T. caraibianus* not developed in the present form. In the keels bearing pores the posterior lateral lobe is not strongly reduced and retracted as in *T. caraibianus*, the anterior of its divisions remaining as a prominent lateral lobe.

Length of type about 5 mm.

171. CYNEDESMUS ORNAMENTATUS (Karsch).

Cryptodesmus ornamentatus Karsch, Mitth. Münch. ent. ver., 1880, **4**, p. 142.[1]

Habitat.— CUBA.[1]

STYRAXODESMUS, gen. nov.

Differentiated from Lophodesmus by having the penult tergite strongly prolonged caudad as two stout submedian processes which much exceed the last tergite. The last tergite is reduced and covered from above by the penult; lobed, tuberculate.

Pore tubercles on dorsal side of edge, extending upward, occurring only on somites five, ten, thirteen, and sixteen, this pore arrangement distinguishing the genus from Urodesmus Porath and Cryptogonodesmus Silvestri.

Genotype.— *S. furcatus*, sp. nov.

172. STYRAXODESMUS FURCATUS, sp. nov.

Type.— M. C. Z. 4,479. Haiti: Jacmel, December, 1912. W. M. Mann.

Strongly, hemicylindrically arched above, with the keels depressed. Brownish over a yellow ground. With two submedian ridges or combs formed of larger tubercles as in species of Treseolobus and Lophodesmus. Of these large tubercles there are three in each row on each tergite excepting in the anterior four or five when there are but two. The upper surface of the keels is finely granular. Free border of first tergite emarginate at the middle line in front; divided by radial ridges into ten lobes of which those adjoining the median line are shortest. Lateral margin of second tergite two-lobed with the caudal of these more weakly again divided. Lateral margin in other keels weakly bilobed, the emargination abrupt, narrow.

Length about 4 mm.

HOMODESMUS, gen. nov.

This genus is like Treseolobus and Styraxodesmus in having the first tergite extended forward so as to conceal the head. Antennae short, almost wholly concealed in a groove beneath the edge of the first tergite. The free margin of the first tergite is crenate and the border is crossed by sulci defining twelve corresponding lobes. The first and second tergites wider than the following ones. The dorsal surface of all tergites densely and closely covered with rather large tubercles which are of nearly uniform size, with no trace of the larger series present in Treseolobus, and so forth; the tubercles on each ordinary tergite form three transverse rows. The last tergite is large, freely exposed, tuberculate above and with the free margin crenulate or lobed. The keels are high on the sides, depressed. The genus is readily differentiated from the related ones in bearing the porigerous cones or processes on somites V, VII–XVIII (XIX).

Genotype.— *H. parvus*, sp. nov.

173. HOMODESMUS PARVUS, sp. nov.

Type.— M. C. Z. 4,480. Haiti: Manneville, December, 1912. W. M. Mann.

The general color is yellowish brown, uniform. The dorsum is strongly arched, high. The keels much depressed. Head above labrum strongly roughened with ridges and tubercles. First tergite high, the free border but little depressed below the general level, covered with about five transverse rows of tubercles uniform in size and even in arrangement. The second tergite anteriorly a little wider than the second but narrowing caudad, with the anterior lateral border clearly more elevated than the posterior lateral. The second somite, especially the keels, much longer than those immediately following. The keels of the fourth and following segments have each a single distinctly projecting lobe or tubercle on its caudal margin; the lateral margin is trilobate in all. The porigerous process extends obliquely caudolaterad between the most caudal lateral lobe and the caudal one. The anal tergite with eight or ten marginal crenations; the anterior row of tubercles elongate, much exceeding the more caudal ones in size.

In the male gonopods the basal lobe is subconical with the side against the segment and the tip cephalad, curving mesad, and touching the edge of the sixth segment. The principal distal process arises on its mesoventral side, runs forward against it to its anterior end and then evenly curves freely ventrad; from near the base of each blade, which is wide and somewhat concave, arises a short, transparent, ventrally directed lobe which is distally subtruncate.

Length, up to 6 mm.; width, .7+ mm.

CHELODESMIDAE.

AMPHELICTOGON, gen. nov.

Differing from Leptodesmus Saussure (type *L. carneus*) primarily in the character of the male gonopods which bear at the end of the principal (caudal or ventral) branch a long and slender seminiferous style which is more or less coiled; the upper or anterior branch ends in a narrower flattened blade which is also somewhat coiled, curving proximad and ordinarily crossing the one of the opposite side. All have one or two teeth on the caudal margin of the keels. With few exceptions the legs and antennae are reddish in whole or in part.

Genotype.— *A. cubanus*, sp. nov.

174. AMPHELICTOGON CUBANUS, sp. nov.

Type.— M. C. Z. 4,484. *Paratypes.*— M. C. Z. 4,485. Cuba: Guantanamo, Bayate de Guantanamo, 1913. C. T. Ramsden.

Differentiated from *A. couloni* in having the style coiled in the reverse direction at the base, its course running mesad and then ventrad, ectad and around, the free distal portion running in tangent to the lower inner side of the coil instead of to the upper. The shoulder on the distal side of dorsal branch much smaller than in *A. couloni*.

Second, third, and fourth articles of antennae not much differing in length, long and slender; sixth article thickest; seventh hemispherically rounded.

Anterior and lateral margins of keels evenly and continuously rounded, smooth, thickened progressively more and more in going to the caudal angle. Caudal angles broad, only little produced as usual in species of Leptodesmus. The caudal margin of each keel presents two nodular thickenings projecting as weak rounded teeth of which the more ectal is the larger. Dorsal surface of metazonites divided into three transverse rows of polygonal areas of which those of the anterior row are largest and in going caudad become more vaguely separated. Dorsum only slightly convex, the keels horizontal. Anal tergite subtriangular, sides concave, tip truncate.

Sternites without processes or that of the fourth somite with a longitudinal furrow forming a slight ridge on each side which continues forward as a slight low cone.

When in full color the dorsum is dark chocolate-brown to black with the lateral margins of the keels yellow and the caudal margin of the metazonites narrowly margined with yellow, the light stripe widening at the middle and extending forward and also caudad along the following prozonite. The black of prozonite extends down the sides nearly to the legs, the pleurae appearing dark, often black like dorsum. The venter, legs, and antennae yellow with the legs and antennae decidedly pinkish over the distal joints. Labrum and lower sides of head also pale and of pinkish tinge.

Length of type, a male, 31 mm.; width, 4.1 mm.

175. AMPHELICTOGON RUBRIPES, sp. nov.

Type.— M. C. Z. 4,485. Cuba: Oriente Province, Belona, June 16, 1914. C. T. Ramsden.

The general appearance is strongly characterized by the red legs and antennae, the red being much deeper than in *A. cubanus*, and the presence of a median longitudinal stripe of yellow which is continuous from the second tergite to the caudal end of the body and in some also extends across the first plate. The first tergite is marked with a yellow spot on the median line in front or the mark may cross to the caudal margin in dumb-bell form. The lateral borders of the keels are also yellow. The dorsum elsewhere black. Head black excepting the labrum and lower sides which are yellow of a slight pinkish tinge. Legs yellow proximally. Face with numerous long hairs below level of antennae.

The dorsal surface of the tergites smooth and shining, a few obscure granules toward each side, in the posterior somites densely finely granular; with no polygonal area, like those of *A. cubanus*, at all indicated. Excepting the posterior ones, the caudal corners of keels but slightly produced, narrowly rounded. Caudal margin of keel with a slight obtusely angular projection, the margin there with a nodular thickening; sometimes a second smaller nodular thickening at extreme mesal end.

The gonopods in the male have the typical general structure. The basal loop of the style brings the free portion over from above and at the anterior edge of the loop, the free portion strongly curving sigmoidally, the tip running cephalad. The terminal blade of the dorsal branch curves in a semicircle, smaller than usual, with the apex extending ectad close to the branch below origin of the blade.

Length, (female paratype), 42 mm.; width, 5.5 mm.

Mr. C. T. Ramsden, also collected this species in the Oriente Province at Ojo de Agua de Filipinas.

176. AMPHELICTOGON OBSCURUS, sp. nov.

Type.— M. C. Z. 4,489. Cuba: Guantanamo, La Cabrera, April 9, 1913, under stones. *Paratypes.*— M. C. Z. 4,490, 4,491. Cuba: El Ocujal, October 13, 1913. C. T. Ramsden.

In size and general appearance suggesting *A. pallidipes;* but when in full color the legs and antennae are bright red excepting the proximal joints of legs and the tarsal tips. The dorsum is deep blackish or chocolate-brown, paler over keels but not clear yellow, lightest at the margin; the caudal border also obscurely lighter, the lighter stripe widening at middle.

Teeth of caudal margin of keels in usual position, the outer one of moderate size, acute but broad across base, much larger than the inner one. Processes of nineteenth keels very short, narrow, and subacute distally.

Easily distinguished by the structure of the male gonopods. The projecting angle on the ectal side of the dorsal branch near the distal end of the length is longer, more slender and more acute than in the other species. Style very characteristic; this from its origin runs cephalad and then curves ventrad, back caudad and then dorsad to complete a circle, thereafter running mesad and toward the end coiling in corkscrew manner. Terminal blade of upper (anterior) branch long and slender, running mesad or a little ventrad of mesad, then caudad and curving dorsad and back a little cephalad, widely crossing that of the opposite gonopod.

Length (male type), about 25 mm.; width, 3 mm.

177. AMPHELICTOGON DENTATUS, sp. nov.

Type.— M. C. Z. 4,492. *Paratype.*— M. C. Z. 4,493. Cuba: Alto de La Union, Mt. Libano, May 18, 1913. Under stones. C. T. Ramsden.

In the color-markings this species much resembles *A. cubanus;* but the yellow lateral border of the keels is obviously broader as is also the stripe along the caudal edge of the metazonites. The latter stripe is similarly extended at the middle, the yellow spots on the middle of the prozonites being especially conspicuous. The first tergite is bordered with yellow all around. The head is yellow adjacent to the first tergite and, as usual, over the labrum and lower side of head and about antennal sockets. Head and dorsum elsewhere shining black. Venter and lower part of sides yellow. Upper part of pleurae blackish. Legs yellow, weakly tinged with pink, the antennae more strongly so.

The species is easily separated from *A. cubanus* in presenting at the middle of the caudal edge a large angular tooth much more conspicuous than in that species and more acute and less nodule-like. The dorsal surface of the metazonites shows no distinct polygonal areas. In the anterior region the metazonites are smooth excepting at the sides; but caudad the entire surface becomes densely finely granular or has a finely appearance under magnification. The caudal produced angles of the nineteenth tergite are much more acute than in *A. cubanus.*

Length of female type, 38 mm.; width, 5.5 mm.

178. AMPHELICTOGON ZYGETHUS, sp. nov.

Type.— M. C. Z. 4,494. *Paratype.*— M. C. Z. 4,495. Cuba: Guantanamo, San Carlos, March 20, 1914. C. T. Ramsden.

The first tergite is black excepting for a narrow border of yellow all around. A few following somites are similarly black excepting the keels and a narrow stripe along caudal margin which are yellow. In the other regions the prozonites above are black excepting a yellow spot at the middle; the metazonites have a dark, reddish brown to black, area at the middle while laterally they are unevenly diluter brown over a yellow ground, the dark color denser in a spot at the base of each keel; keels and caudal margin clear yellow. Head black excepting for the labrum and lower sides of head as usual. Venter and lower part of sides yellowish. Legs proximally yellow, distally, excepting extreme tips, strongly reddish, the red much denser than in *A. cubanus* and *A. dentatus* and approaching the condition in *A. rubripes.*

The dorsal surface of the tergites in general smooth and shining, not obviously tubercular and with no definite polygonal areas. Caudal corners of keels in anterior and middle regions but little produced, apically rounded, broad; in the last few plates more strongly produced caudad, broad, distally narrowly rounded. The processes of the nineteenth keels less prolonged and acute than in *A. dentatus.* On the caudal margin of each keel one, and in the middle and anterior region, two teeth or angular projections, the outer one of these conspicuous as in *A. dentatus.*

Length, (female type), about 33 mm.; width, 5 mm.

179. AMPHELICTOGON PALLIDIPES, sp. nov.

Type.— M. C. Z. 4,496. Cuba: Guantanamo, Mt. Libano, Las Termapilas, March 30, 1913, under stones in damp woods. C. T. Ramsden.

Differing in general appearance from the other species, in wholly lacking the red coloring in the legs and antennae, these being uniform yellow. The dorsum is from deep brown to nearly black, excepting the keels and a narrow line or stripe along the caudal margin of each somite, which are yellow; the caudal stripe widens and extends angularly forward at the middle. The prozonites show no light area above. The head has the usual color-pattern.

The dorsal surface under the microscope appears strongly though finely roughened, granulate. Caudal corners of keels less produced than usual, more angular. Caudal margin of keels with the usual dentiform processes; of these the outer one is much broader across base than in any of the other species. Processes of nineteenth segment short, distally rounded.

The gonopods of the male resemble most those of *A. subterreanus* (Saussure) as figured by Carl, (Rev. Suisse zool., 1903, **11**, pl. 16, fig. 14) but the terminal blade of the upper branch is longer and more strongly coiled, with a number of stout teeth springing from its caudal edge. The lower branch lacks the tooth on the mesal side just proximad of the origin of the style which is present in *A. subterreanus;* the style at base is coiled into a nearly complete circle instead of being simply bent in U-form and it is also distally more coiled. There are various other differences in details.

Length (male type), 30 mm.; width, 3.5 mm.

180. AMPHELICTOGON GUANTANAMANUS, sp. nov.

Type.— M. C. Z. 4,497. Cuba: Guantanamo. *Paratypes.*— M. C. Z. 4,498, 4,499. Cuba: Oriente Province, Belig, near Cape Cruz. C. T. Ramsden.

Readily distinguished by the structure of the male gonopods. The terminal blade of the upper branch curves mesoventrad, then proximad (caudad) and then back dorsoectad and somewhat distad (cephalad). The two blades touching at middle line but not crossing. The style from its base curves mesoventrad, then ventrad and proximad, next running dorsad and then mesad above the blade of the upper branch.

The general color-pattern is as in *A. dentatus* but the black of the latter species is replaced with chocolate-brown and the caudal yellow line of the metazonites does not widen or extend forward at the middle. The yellow area is present on the prozonites as in that species. The antennae and legs tinged with red as in that species, but the color obviously deeper on the legs.

The teeth on the caudal margin of the keels are distinct but obviously less produced than in *A. dentatus*. The caudal processes of the nineteenth keels are shorter and much more rounded than in that species.

The species is also clearly more slender than *A. dentatus*.

Length (female paratype), about 37 mm.; width, 4.5 mm.

181. AMPHELICTOGON FLAVIPES, sp. nov.

Type.— M. C. Z. 4,500. *Paratypes.*— 4,501. Cuba: Guantanamo, Mt. Toro, subida á la "Hembrita." C. T. Ramsden.

Differentiated at once from the species previously described by its bright yellow legs and antennae which show no trace of red. Dorsum deep chocolate to black. Keels yellow, the inner edge of the light area running obliquely caudomesad from the anterior edge on each keel, the areas smaller in posterior region. Posterior borders of tergites vaguely and very narrowly lighter, obscurely reddish. Head black above, the black area extending between antennae and expanding in a small subcircular area below. Labrum and lower sides of face pale as usual.

Principal process on caudal margin of keel low, very broad and obtuse, commonly rounded, often inconspicuous except as a weak angulation of the margin.

The gonopods of the male are very distinctive. The blade of the upper branch curls strongly ventrad and proximad and then again dorsad and distad, crossing that of the opposite gonopod. The style curls in a similar manner close against the distal end of the ventral branch, its distal portion curving back distad behind the blade of the upper branch. The outer "shoulder" or angular projection of the dorsal branch is much less pronounced than in *A. pallidipes* and is farther proximad.

Length (male type), about 29 mm.; width, 4.3 mm.

182. AMPHELICTOGON JUVENIS, sp. nov.

Type.— M. C. Z. 4,502. Cuba: Guantanamo, Belona Oriente, January 16, 1914. C. T. Ramsden.

The dorsum in the middle and caudal regions dull yellow of a light brownish cast, the brown pronounced in the anterior region, particularly at the sides, leaving a lighter median stripe. The middle and posterior regions showing a dark median longitudinal stripe.

The head shows a deeply impressed vertigial sulcus.

First plate with keels high, giving plate appearance of being nearly horizontal, the median region being but weakly convex: anterior and lateral margins forming an even semicircle. Lateral serrations sharp and distinct from the second keels caudad to the eighteenth inclusive, the teeth of the middle region especially large. Tooth on caudad margin of keel distinct, low and obtuse anteriorly, but acute and conspicuously projecting in posterior region (*e. g.*, on fourteenth, fifteenth, and sixteenth keels). Anterior keels in general high, insertion becoming progressively lower in going caudad. Legs more slender than usual.

Process of anal tergite widely surpassing the strongly marginate anal valves.

Length near 16 or 17 mm.; width, 2.9 mm.

While the type of this species is not mature, consisting of but nineteen segments, it is sufficiently distinguishable, particularly because of the strong lateral tooth on all keels from second to eighteenth inclusive, a feature not shared by any other species.

183. AMPHELICTOGON MACULATUS, sp. nov.

Type.— M. C. Z. 4,503. *Paratypes.*— M. C. Z. 4,504. Cuba: Los Hondones, October 25, 1914. C. T. Ramsden.

This species presents a seemingly very characteristic color-pattern which is uniform in the several specimens, all of which are unfortunately females. In the middle and posterior regions of the body the metazonites are pale, dilute brown or chocolate over a yellow ground with the keels and mid-dorsal region clear yellow, but on each prozonite each side of the middle dorsally there is a transversely elongate spot of deep chocolate and on the side below the level of the keels an entirely separated similar spot. The first dorsal plate has two dark spots or these may be confluent mesally. The head is pale across the base but adjacently shows a dark area which runs to a point between the antennae below which it does not descend, the head elsewhere yellow.

Lateral teeth on keels from second to eighth. Tooth of caudal margin of keel is in part acute, of moderate size. Caudal processes of eighteenth keels equalling or a little exceeding those of the seventeenth.

Length (female type), 26 mm.; width, 4.5 mm.

184. AMPHELICTOGON MANNI, sp. nov.

Type.— M. C. Z. 4,505. Haiti: Diquini. W. M. Mann.

In coloration much resembling *A. maculatus* of Cuba; but in addition to the chocolate colored areas on the prozonites above, there is a similarly colored and distinct stripe across the anterior border of each metazonite, and the marks on the sides of the prozonites are less spot-like, being much more extended ventrad in the form of narrow stripes. A distinct dark mark under each keel but this obviously smaller than that of the prozonite. Head yellow excepting for a triangular chocolate-colored area above of which the apex extends between the antennae. Legs and antennae yellow.

Teeth of second, third, and fourth keels each with a minute lateral tooth.

The cauda is obviously shorter than in maculatus and is straighter.

A less robust species than *A. maculatus.*

Length (female type), about 22 mm.; width, 3.8 mm.

185. AMPHELICTOGON BAHAMIENSIS, sp. nov.

Type.— M. C. Z. 4,506. Andros: Mangrove Cay, August, 1904. O. Bryant.

This species is clearly distinct in the character of the gonopods. The blade of the upper branch curves across the end of the lower branch with the convexity cephalad; it crosses that of the other gonopod and is distally strongly narrowed, acuminate. Proximad of the base of the style on the mesal side there is an acute tooth similar to that of *A. subterreanus* but much longer. The style from its origin coils ventrad and then proximad against the distal end of the branch, then running mesad and curving into a loop at the end.

The general color of the poorly preserved type is brownish above, with the keels lighter.

The keels are but little extended with the caudal process in posterior region unusually small.

The size is small, the exact length not being ascertainable. Width (male type), 2.2 mm.

186. AMPHELICTOGON COULONI (Humbert and Saussure).

Polydesmus couloni Humbert et Saussure, Rev. mag. zool., 1869, p. 151.[1]

Habitat.— CUBA.[1]

187. AMPHELICTOGON SUBTERREANEUS (Saussure).

Polydesmus subterreaneus Saussure, Linn. ent., 1869, **13**, p. 323.[1]

Habitat.— CUBA.[1]

CARAIBODESMUS, gen. nov.

This genus covers in part the ground of Odontopeltis as used by Pocock in his treatment of the West Indian polydesmoids. But Pocock proposes Odontopeltis as a substitute for the preoccupied name Rachophorus Koch, the type of which, *Polydesmus conspersus* Perty, is a Brazilian species of uncertain position but certainly not congeneric with the West Indian species.

This genus is readily distinguished by the structure of the male gonopods. In this the lower or principal seminiferous branch is a rather broad simple blade, sometimes bent and often expanded at the distal end but produced into a style or other elongate slender process. The accessory upper branch is in comparison very short; it may be double but is not produced into a slender blade or process; it commonly lies close against the upper surface of the lower branch.

Antennae long and slender.

Metazonites commonly crossed by a furrow caudad of which there are some elevated areas or tubercles commonly not crowded and sometimes projecting as dentiform angles at the caudal margin; more sparse areas or tubercles on anterior part of plate may be present. Keels high, the dorsum low, much as in Polydesmus.

Pores normal, occurring on somites five, six, nine, ten, twelve, thirteen, and fifteen to nineteen.

Last tergite triangular, with narrowed cauda posteriorly. Anal valves mesally margined.

Genotype.— *C. bruesi*, sp. nov.

188. CARAIBODESMUS BRUESI, sp. nov.

Type.— M. C. Z. 4,507. Jamaica: Liguanea Plain, November–December, 1911. C. T. Brues.

In coloration nearly the same as *C. verrucosus*, the prozonites being dark chocolate-brown as are also the metazonites in a band across their anterior border but extending only on the proximal portion of the keels, the metazonites elsewhere yellow. Head chocolate-colored above level of antennae, a narrowed pointed tongue of the same color extending down between the antennae, and a dark tongue also on each side extending from the ectal side of the antenna a short distance mesoventrad. Head elsewhere yellowish. Legs yellow and antennae brownish yellow. Venter yellow.

At once separable from *C. verrucosus* in having no lateral marginal serrations on the keels of the eleventh and twelfth somites whereas there are prominent teeth in the latter as well as in a quite different tuberculation of the dorsal surface, the areas outlined caudad of the suture being large and low, not projecting as distinct caudal teeth, and the surface elsewhere not densely finely tuberculate.

The gonopods differ from those of *C. verrucosus* at a glance in that the principal branch is much more slender, slightly narrowing distad rather than expanding and curving strongly ectad at the distal end. Toward the distal end of the femoral region expanded mesad and then in contact with the other gonopod. The lesser branch arises mesodorsad of the principal one and extends distad to the middle of its expanded femoral region.

Length, 26 mm.; width, 3.25 mm.

189. Caraibodesmus insignis, sp. nov.

Type.— M. C. Z. 4,508. *Paratypes.*— M. C. Z. 4,509. Haiti: Furcy. W. M. Mann.

This species is strikingly colored. The prozonites are black above and down the sides to the level of the legs. The metazonites in general are red excepting along the anterior border of all, which is blackish, while in the middle and posterior region of body the black also is present along the caudal border and often extends forward as a lunate or semicircular area. Last tergite black across the base, elsewhere reddish. Legs dilute brown to yellow. Antennae, in full color, chestnut. Head black above; immediately below antennae red in a transverse area, while the labrum is flavous.

A single serration on lateral margin of keels from second to fifth, or a slight one also on sixth, none on the others. The entire surface of metazonites densely tubercular and nodular, the tubercles being of varying sizes and form but many of them extended longitudinally; a series of longer low ridge-like, elevations along the caudal margin, of which one or two on each side near base of keel are largest and project freely caudad as short obtuse teeth. In some cases the ridge-like folds are traceable forward nearly entirely or else entirely across the metazonite.

Length of type (female), near 26 mm.; width, 3.6 mm.

190. Caraibodesmus pellus, sp. nov.

Type.— M. C. Z. 4,510. Jamaica: Liguanea Plain, 1911. C. T. Brues.

Very dark in color above, the metazonites dark chocolate, the prozonites more blackish, the keels above paler. Entire head blackish, the labrum above slightly lighter. Legs yellow. Antennae dark like the head. Venter plae as usual.

In its dark color resembling *C. mammatus;* but the sculpturing of the plates much more extensive. Along border of metazonites caudad of the sulcus in the anterior six, in the others seven or eight, areas are outlined, each of which is strongly granulate or finely tubercular and bears one larger tubercle projecting caudad as a prominent tooth. In the anterior region a row of four densely finely tubercular areas is present, on each a larger rounded tubercle; while between the anterior and posterior row on each side are two intermediate areas each with a central large tubercle. The twelfth keels have each two large distinct serrations as against four in *C. mammatus*, the eleventh having also two with weak indication of a very obtuse third one as against the four small, sharp serrations in the second species.

Length, near 18 mm. (female type).

191. CARAIBODESMUS TUBERCULATUS (Attems).

Odontopeltis tuberculatus Attems, Denkr. kais. akad. wissens. Wien, 1900, p. 403.[1]

Habitat.— JAMAICA.[1]

192. CARAIBODESMUS MORANTUS (Karsch).

Polydesmus (*Rhacophorus*) *morantus* Karsch, Arch. nat., 1881, **47**, p. 39.[1]

Habitat.— JAMAICA.[1]

193. CARAIBODESMUS VERRUCOSUS (Pocock).

Odontopeltis verrucosus Pocock, Journ. Linn. soc. London, 1894, **24**, p. 516, pl. 39, f. 6–6d.[1]

Habitat.—JAMAICA (T. D. A. Cockerell, T. Townsend).[1]

194. CARAIBODESMUS FORMOSUS (Pocock).

Odontopeltis formosus Pocock, Journ. Linn. soc. London, 1894, **24**, p. 517, pl. 39, f. 7.[1]

Habitat.— JAMAICA: Mandeville (T. D. A. Cockerell).[1]

195. CARAIBODESMUS MAMMATUS (Pocock).

Odontopeltis mammatus Pocock, Journ. Linn. soc. London, 1894, **24**, p. 518, pl. 39, f. 8–8b.[1]

Habitat.— JAMAICA: Mandeville (T. D. A. Cockerell).[1]

196. Caraibodesmus (?) sallei (Saussure).

Polydesmus sallei Saussure, Faun. Myr. Mex., 1860, p. 42, pl. 2, f. 8.[1]
Odontopeltis sallei (Saussure), Pocock, Journ. Linn. soc. London, 1894, **24**, p. 512.[2]
Leptodesmus sallei (Saussure) Silvestri, Bull. Amer. mus. nat. hist., 1908, **24**, p. 575.[3]

Habitat.— Antilles.[1] Haiti.[2] Santo Domingo.[2] Porto Rico: Utuado, Monte Mandios (W. M. Wheeler).[3]

This and the two following leptodesmoid forms cannot be placed with certainty but are evidently close to the species above included in Caraibodesmus and may prove to be wholly congeneric with them.

197. Caraibodesmus (?) magnus (Bollman).

Rhacophorus magnus Bollman, Proc. U. S. N. M., 1888, **11**, p. 337.[1]

Habitat.— Cuba (F. Poey).[1]

198. Caraibodesmus (?) mauriti (Brandt).

Polydesmus mauriti Brandt, Bull. sci. St. Petersb., 1839, **5**, p. 311.[1]

Habitat.— Porto Rico.[1]

Antillodesmus, gen. nov.

Related to Caraibodesmus but the dorsal surface of metazonites wholly smooth and the male gonopods of very different form. Each gonopod is stout proximally and distally presents three slender and acute prongs subequal in length.

Genotype.— *A. grenadanus*, sp. nov.

199. Antillodesmus grenadanus, sp. nov.

Type.— M. C. Z. 4,511. *Paratypes.*— M. C. Z. 4,512. Grenada: Grand Etang, November, 1912. R. Thaxter.

Above deep chocolate colors excepting the yellow keels and a yellow central area on each metazonite, this area subquadrate in outline and completely enclosed, not triangular and lying against the caudal margin as in *A. vincenti.* The eighteenth and nineteenth tergites either solid black or deep chocolate, or the eighteenth with a much smaller central light dot. The last tergite deep colored excepting the process which is yellow. The head is solid black or deep chocolate between the antennae excepting for a germinate light spot; the upper surface of head closely areolated in dark over a paler ground. Legs yellow, the antennae somewhat darker.

In the gonopods of the male the proximal division is much broader, subtriangularly narrowed distad as seen from below. The middle process narrowly blade-like, curving distomesad and crossing at the tip the one from the other gonopod. Dorsal prong much more slender than the others.

Length (male type), 22.5 mm.; width, 2.8 mm. The females much more robust, an average female paratype measuring 25 mm. in length and 4 mm. in breadth.

200. ANTILLODESMUS VINCENTI (Pocock).

Odontopeltis vincenti Pocock, Journ. Linn. Soc. Lond., 1894, **24**, p. 514, pl. 39, f. 4–4d.[1]

Habitat.— ST. VINCENT (H. H. Smith).[1]

CUBODESMUS, gen. nov.

In this genus the upper or anterior branch of the male gonopods is strongly narrowed from near the middle distad and ends in a slender blade which may be straight or weakly curved but not coiled. The principal or lower branch is curved ectad or even subgeniculate above the distinctly separated femoral division; it bears distally three short and often spiniform processes, two of which are suberect while the most dorsal curves more or less mesad.

Dorsum smooth. Keels high, with caudal angles broad and, excepting the most caudal, subrectangular or but slightly produced. Caudal margins smooth.

Anal tergite triangular, tip more or less decurved and narrowly truncate.

Genotype.— *C. ramsdeni,* sp. nov.

201. CUBODESMUS RAMSDENI, sp. nov.

Type.— M. C. Z. 4,513. *Paratypes.*— M. C. Z. 4,514. Cuba: Guantanamo, San Carlos on Rio Seco, in rotten wood, April 22, 1914. C. T. Ramsden.

In this form the upper (anterior) branch of the gonopods widens a little near its middle and then narrows strongly distad; midway between widest median region and the apex it is geniculate, the distal arm moderately curving, acute. The lower or caudal branch distad of the short stout and subcylindrical femoral division is evenly curved, the convexity being ectad; the apical region, flattened and slightly twisted, bears three slender and short processes, an erect, only slightly curved, acute median distal one, below this a stouter and larger, weakly sigmoidally flexed, and also suberect one and above it a process that curves caudad of mesad, is of uniform width throughout and is rounded at its apex.

The dorsum is chestnut with the keels yellow. In some a darker median dorsal line is manifest in the posterior region. Head chestnut excepting labrum and lower sides of face which are yellow. Venter and entire pleural region, as well as the legs and antennae, yellow.

The dorsum is smooth. Keels high, the posterior area somewhat more depressed than the anterior and median ones. Posterior angles of keels broad, the first ones subrectangular, the others slightly produced excepting the most caudal ones which are more extended as usual; those of the nineteenth somite, short, submucronate, much smaller than those of the eighteenth, those of the seventeenth largest. Caudal margins of keels smooth throughout. The lateral margins also wholly smooth excepting in the fourth to ninth somites inclusive on each lateral margin of which there is a small serration toward the anterior corner.

Tip of anal tergite conspicuously decurved.

The genital cones of the second coxae in the male are low and rounded. The sternite between the third legs bears a pair of low rounded eminences each of which bears a small slender, mammilliform process. The next sternite bears four low, rounded eminences, and the succeeding one two. Other sternites without processes.

Length (male type), about 40 mm.; width, 6 mm.

202. Cubodesmus latior, sp. nov.

Type.— M. C. Z. 4,515. Cuba: Guantanamo, La Hembrita, Mt. Toro. *Paratype.*—M. C. Z. 4,516. Cuba: Los Hondones, La Union, Mt. Libano. C. T. Ramsden.

This is a larger species than the preceding. It is readily distinguished from that species in the uniformly rectangular caudal corners of the keels of all excepting the last few somites in which they are produced as usual. In contrast with *C. ramsdeni,* the processes of the eighteenth tergite are longest and much more strongly exceed those of the nineteenth. A lateral tooth occurs on each side of only the second to fourth tergites inclusive, those of the second minute, the others distinct. In a paratype all lateral teeth obsolete. Cauda less decurved.

Type, which is not in full color, with yellow keels, the dorsum brown elsewhere. Ventral and pleural regions and appendages yellow.

A paratype from Los Hondones has the dorsum deep black excepting the keels and a pale stripe along caudal borders of tergites. The black of head continues between antennae and widens but little below as a small circular area.

The terminal processes of the third sternite similar to those in *C. ramsdeni,* but more conical.

In the male gonopods the femoral division is longer and proportionately more slender.

The principal or ventral (caudal) branch is much more strongly bent ectad at base; geniculate. The terminal processes are somewhat similar but the erect distal one is shorter, while the principal or dorsal one instead of remaining of uniform width with the tip rounded and straight, is strongly narrowed, with the tip acute or very narrowly rounded and strongly curved ventrad.

Length (male type), about 42 mm.; width close to 7 mm.

203. Cubodesmus proximus, sp. nov.

Type.— M. C. Z. 4,517. Cuba: Guantanamo, Mt. Toro, Ramon el Moro, Nimfilas, May 2, 1914. C. T. Ramsden.

This species is very close in general structure to *C. latior,* but differs in details of the male gonopods. The central distal process of the principal branch and the lower (seminiferous) process are shorter and less slender and are distinctly uncate at tip in contrast with the condition in *C. latior,* which may show a slight uncation of the inferior process only. These two processes are much more nearly parallel, less divergent, than in *C. latior.* The dorsal process is of nearly uniform width throughout and is broadly rounded at the tip as in *C. ramsdeni* but is much longer than in that species, not strongly curved distally as in *C. latior,* this being apparently an easy mark of recognition.

The lateral margin of each third keel bears a weak serration, that of fourth a distinct one, that of fifth and sixth weak ones again, the others none. The angulation of the keels as in latior.

The dorsum in general black excepting for the yellow keels; a reddish yellow stripe along the caudal border of each tergite which is somewhat widest at the middle. Anterior half of each prozonite also light in color. In a few of the most caudal tergites (*e. g.,* nineteenth, eighteenth, and seventeenth) the caudal border black with a light stripe between this and the main black area of the plate. First tergite bordered all around with light and a light median longitudinal line dividing the dark central area more or less into two halves. Head black excepting below as usual.

This is a proportionately more slender species than *C. latior.*

Length (male type), near 46 mm.; width, 6.8 mm.

It is possible that the differences shown by the type-specimen may not be sufficient to maintain this form as distinct from *C. latior*; but until ample material allows this to be definitely determined, it seems better to maintain this as a separate species.

204. CUBODESMUS PELOPLEURUS, sp. nov.

Type.— M. C. Z. 4,519. ♂. *Paratypes.*— M. C. Z. 4,520 ♀. Cuba: Oriente Province, Belona, January 16, 1914. C. T. Ramsden.

In coloration this species is seen at a glance to differ conspicuously from the others here described in having the black color of the prozonites continued ventrad nearly to the level of the legs. The metazonites are also dark below the keels, though not black. Dorsum black excepting the keels which are yellow. The tergites are either not at all, or else only very narrowly margined with lighter color along caudal edge. The prozonites are lighter in a very narrow line along anterior margin. The first tergite is yellow over the keels and in a narrow anterior line but not along the decidedly incurved caudal margin. The black of head extending between antennae and expanding laterally below them. Labrum and lower sides yellow. Only the process of anal plate yellow.

Processes of nineteenth tergite very small; those of the eighteenth abruptly larger but not nearly so large as in *C. latior*, being smaller than those of the seventeenth. Dorsum smooth. A single serration on each side in the usual position on somites three to seven inclusive.

In the gonopods of the male an obvious difference from the other species lies in the more broadly expanded middle region of the dorsal branch, the two being contiguous in the region and diverging from this level both proximad and distad. The distal or median process of the principal branch is exceptionally short, distally rounded, and even obliterated on right gonopod of type; the dorsal process is long, not much narrowed distad, distally rounded, not at all or but slightly curved, crossing the one from the opposite gonopod.

Length (male type), 41 mm.; width, 5.7 mm.

Thus considerably more slender than the previously described species.

205. CUBODESMUS PRINCEPS, sp. nov.

Type.— M. C. Z. 4,521. Cuba: Guantanamo, Mt. Libano, La Union, under stones in woods, March 23, 1913. C. T. Ramsden.

This is the largest of the known species. The dorsum is black with the keels paler, obscure yellow, the light area narrower than usual. The last tergite is dark throughout, or but obscurely paler distad, in strong contrast with the other species. The first tergite is obscurely paler only at the caudal corners of carinae, elsewhere solid black. No trace of light marginal cross stripes. Pleural and ventral regions brown. Anal scale with distal portion characteristically black. Head black above, the dark area extending between antennae below which it again widely expands nearly to the lateral margin. Labrum and sides of face obscurely lighter. Legs proximally brown, distally yellow. Antennae yellow.

Caudal angles of keels in general less rectangular than in *C. latior*, most being weakly produced. Last processes small as usual, those of the eighteenth keels somewhat smaller than those of the seventeenth. Lateral teeth showing on fourth, fifth, and sixth tergites, obscurely also on next two.

206. Cubodesmus limoneus, sp. nov.

Type.— M. C. Z. 4,522. *Paratypes.*— M. C. Z. 4,523, 4,524. Cuba: Guantanamo, El Palmar, Mal Paso, Mt. Toro, subida á la "Hembrita." C. T. Ramsden.

This species differs strikingly in appearance from all the others in having the keels of a lemon-yellow color with each light area extending a considerable distance upon the dorsum proximad of the keel. Process of anal tergite light. Black of head expanding widely below antennae. Labrum yellowish, of reddish tinge adjacent to the dark area. Prozonites blackish, the dark color extending ventrad to level of legs as in *C. pelopleurus.* Venter and legs and antennae lemon-yellow.

Slight lateral serrations on third and fourth tergites only. Caudal angles in general but weakly extended. Processes of last tergites in general as usual; those of the nineteenth a little longer than those of seventeenth but narrower across base.

Length (female paratype), 43 mm.; width, 7 mm.

Male gonopods of usual type. Distal blade of upper branch short and slender, strongly curving in a half circle. Upper process of upper branch nearly straight, slender.

Ellipodesmus, gen. nov.

Body composed of head and but nineteen segments.

Antennae long and slender.

Dorsum low, only slightly convex, and wholly smooth throughout.

First dorsal plate with anterior lateral margins and forming an evenly convex curve; narrowed subacutely at each side; equalling the succeeding ones in width.

Keels strongly developed throughout; margins thickened.

Pores on somites five, seven, nine, ten, twelve, thirteen, and fifteen to eighteen inclusive; opening on moderate marginal thickenings, the aperture looking subdorsad.

Pores of anal scutum narrow, at tip narrowly truncate. Anal valves mesally strongly margined.

Genotype.— *E. simplex,* sp. nov.

207. ELLIPODESMUS SIMPLEX, sp. nov.

Type.— M. C. Z. 4,526 ♀. Haiti: Jacmel, December, 1912. W. M. Mann.

Metazonites chocolate-brown, paler on keels and lateral region of caudal borders or entirely across the latter, but with a black transverse band between keels across anterior third to half. Also blackish along caudal border in some of posterior segments. Prozonites lighter chocolate-brown with a yellow median dorsal line which expands at the ends in hour-glass manner. This mid-dorsal yellow mark much broader in anterior prozonites. Prozonites also dark colored between level of keels and legs but the color obviously more reddish than above. Head pale across base of vertex and below level of antennae, the remaining area above antennae chocolate-colored, the dark area extending as angular tongue at middle to below level of antennae. Antennae and legs yellowish.

First tergite narrowing subacutely to each lateral end; caudal margin moderately incurved at the middle.

The keels in general are widely extended from pleurae; anterior and lateral margin forming an even, wide curve back to the caudal corner, or this slightly laterally emarginate on porigerous somites; margin without serrations excepting a small one on second, third, or fourth keels. Keels with caudal corners slightly bent caudad, the production increasing going caudad.

Cauda widely surpassing the anal valves.

Length, about 22 mm.; width, 3.6 mm.

TOMODESMUS, gen. nov.

This genus is characterized primarily by having the first dorsal plate with its anterolateral region deeply excised, the excision subrectangular.

Antennae long and slender.

Dorsum high, strongly arched, and wholly smooth. Keels arising low down; very weakly developed except in most anterior segments, but the pores borne on prominent, subcylindrical processes.

Anal scutum produced into a narrow cauda which exceeds the valves. Anal valves mesally strongly margined.

Repugnatorial pores on fifth, seventh, ninth, tenth, twelfth, thirteenth, and fifteenth to penult segments.

Genotype.— *T. thaumastus*, sp. nov.

208. Tomodesmus thaumastus, sp. nov.

Type.— M. C. Z. 4,527. ♀. Cuba: Guantanamo, Mt. Libano, Las Termapilas, March 30, 1913. C. T. Ramsden.

Body pale green throughout excepting that the prozonites across anterior ends above may show a rust-brown coloring. Legs and antennae yellowish.

First dorsal plate deeply subrectangularly excised on each side of the convex middle region in front, the lateral wings comparatively narrow anterocaudally, their anterolateral corner rounded convexly.

Third, fourth, fifth, sixth, and seventh keels with a distinct single lateral serration toward anterior corner. Keels in front of porigerous cylinders becoming lower and more obscure caudad. Porigerous processes of eighteenth somite much smaller than the preceding ones.

Mesal borders of anal valves strongly elevated. Process of last tergite much exceeding the valves, moderately decurved.

Type-specimen consisting of but nineteen segments in addition to the head but perhaps not fully mature.

Length, about 34 mm.; width, 5 mm.

Zigwadesmus, gen. nov.

In this genus the keels in the middle and posterior regions are exceedingly slight, occurring only as weak ridges excepting the process bearing the pores which is distally obliquely truncate, the section being long elliptic and bearing the pore near its center. The first few keels are nearly normal. Keels inserted low down, near middle of height. The dorsum high and strongly arched, wholly smooth.

Anal scutum produced into a narrow caudal process which at the distal end bears two slender conical processes giving it a characteristically furcate appearance. The anal valves are strongly margined and elevated along the mesal edge.

Repugnatorial pores on fifth, seventh, ninth, tenth, twelfth, thirteenth, and fifteenth to nineteenth somites.

Antennae of moderate length, slender.

Genotype.— *Z. brunneus*, sp. nov.

208a. ZIGWADESMUS BRUNNEUS, sp. nov.

Type.— M. C. Z. 4,528. ♀. *Paratype.*— M. C. Z. 4,529. Trinidad: near Port of Spain. Roland Thaxter.

The general color above is dull brown, becoming somewhat darker in going cephalad. The keels and an area immediately above them are pale, while a light spot occurs a little higher on each side of the prozonite. The pleural region also brownish, darker below each keel and along caudal border of segment. Head brown, uniform or nearly so, or vertex a little lighter, the labrum not pale. Legs light brown, the antennae somewhat darker.

Anterior margin of first plate almost evenly convex, slightly flattened caudad of each antenna; caudal margin trisinuate, the plate subacutely narrowed at each side.

A slight lateral serration detectable on second, third, and fourth keels near anterior end. Keels from fifth caudad much reduced. Caudal processes of nineteenth plate very small, almost mucro-like; those of two preceding plates moderate, subconical and acute, equal or nearly so.

The cauda much exceeds the anal valves, its ventral edge nearly straight, the apical cones extending ventrad of caudad.

Length (female type), about 35 mm.; width, 4.5 mm.

STRONGYLOSOMIDAE.

209. ORTHOMORPHA COARCTATA (Saussure).

Polydesmus coarctata Saussure, Mem. Soc. phys. Geneve, 1860, p. 39, f. 18.
Strongylosoma poeyi Bollman, Ent. Amer., 1887, 3, p. 82.[1]
Strongylosoma coarctatum Pocock, Journ. Linn. soc. London, 1894, **24**, p. 512.[2]

Habitat.— CUBA:[1] Havana (W. M. Wheeler). Sierra de Caballos (T. Barbour, W. S. Brooks). GRAND CAYMAN. JAMAICA: Liguanea Plain (C. T. Brues), Port Antonio (A. E. Wight). HAITI: Port au Prince, Momance, Cape Haitien, Grand Riviere, Emery, Manneville, Jacmel, Petionville, Diquini (W. M. Mann). PORTO RICO: Rio Piedras (R. Cotton). DOMINICA (G. A. Ramage).[2] GRENADA: St. Georges. BARBADOS.[2] UNION.[2] TOBAGO: Richmond Bay, near Plymouth (H. L. Clark). TRINIDAD: Port of Spain (R. Thaxter).

210. STRONGYLOSOMA SEMIRUGOSUM (Pocock).

Ann. mag. nat. hist., 1888, ser. 6, **2**, p. 477, pl. 16, fig. d.[1]

Habitat.— DOMINICA (G. A. Ramage).[1]

211. LASIODESMUS CARAIBICUS Silvestri.

Bull. Amer. mus. nat. hist., 1908, **24**, p. 576, f. IX (1–5).[1]

Habitat.— PORTO RICO: Utuado (W. M. Wheeler).[1]

POLYDESMIDAE.

BELONODESMUS, gen. nov.

Body composed of head and twenty somites. Antennae long and slender, distally enlarged, the second and fourth articles longest, the sixth somewhat abruptly thickest.

First tergite narrower than head with mandibles, wider than head without; surface smooth or weakly granular, pilose. Keels well developed, high, marginally elevated, all with strongly produced spiniform caudal angles, these more elevated; laterally serrate and teeth also along caudal margin of most, the teeth setiferous. All tergites excepting the first (cervical) bearing series of tubercles which are more numerous on the middle and caudal ones, the tubercles more or less laterally compressed, elongate and cariniform, setigerous. Excepting first three plates, tergites with a strong transverse sulcus, behind which in most segments there are two rows of tubercles with three or four in front. Prozonites very long, not telescoped in preceding somites, the keels widely separated.

Anal tergite subtriangular, strongly tubercular.

Repugnatorial pores opening near the margin of the keels on the dorsal side; occurring on the fifth, seventh, ninth, tenth, twelfth, thirteenth, and fifteenth to nineteenth segments.

Legs very long.

In the male gonopods the coxae bear chitinous hooks as usual. The distal division segmented, the distal or tarsal division branched in type.

Processes of second coxae in male low.

Genotype.— *B. thaxteri*, sp. nov.

211a. BELONODESMUS THAXTERI, sp. nov.

Type.— M. C. Z. 4,530. *Paratypes.*— M. C. Z. 4,531. Trinidad: Port of Spain. Roland Thaxter.

Body above reddish brown, or in large part cherry-red. Pleural and ventral regions a duller brown. Antennae and legs light brown or distally yellow.

Head with a well-marked vertigial sulcus. Antennae separated by a distance greater than the length of the first article but much less than that of the second. Second article longest; third, fourth, fifth, and sixth not much differing in length; the sixth strongly clavately thickened, the seventh thickened at base and narrowing subconically distad.

First tergite semicircular, with true but narrow lateral keels the caudal angle of which is moderately produced; surface minutely sparsely granular, pilose. Second tergite with three rows of strongly developed tubercles; each keel with two lateral teeth in front of the caudal spine, the caudal margin with none, the anterior convex and smooth. Third and fourth with three lateral teeth on each side in front of the caudal process, with three rows of tubercles. Fifth somite on each side with three lateral teeth and four rows of tubercles, the sixth with four lateral teeth, the following pore-bearing segments with three, the number of rows of tubercles increasing. On the most posterior tergites the tubercles undergo reduction in size, on the eighteenth and nineteenth being very small, almost granule-like, on the seventeenth intermediate.

Anal tergite narrowly truncate at tip. The first marginal tubercle proximad of the tip on each side elongate, much longer than the others.

In the male the third joint of the second legs of the sixth somite is more crassate than in other legs, is bowed, and bears at the proximal end from the ventral side a short, uncate process.

Distal division of phallopod in male with a shorter process anteromesal in position and outer longer and more slender process which runs proximad along the phallopod, curving then first ectad and then distad (cephalad).

Length of type, a male, 16.5 mm.; width about 1.5 mm. The female is more robust.

MESETHODESMUS, gen. nov.

In general appearance resembling Scytonotus but composed of head and twenty somites instead of nineteen.

Antennae moderately long, strongly clavate to the sixth article. Articles excepting those at the ends constricted at base, strongly thickened distally.

First tergite somewhat narrower than head inclusive of mandibles. All tergites (metazonites), including the first and anal, strongly tubercular; the tubercles arranged mostly in six or more transverse series, each bearing a long setose process and those along the caudal margin, particularly in the posterior region, projecting as teeth or serrations as in Peridontdesmus but not serrate anteriorly. Keels with caudal corners rounded, not at all produced, more angular in posterior somites.

Repugnatorial pores occurring on the fifth, seventh, ninth, tenth, twelfth, thirteenth, and fifteenth to nineteenth segments. The pores in general on the dorsal side of the keel on a rounded or conical elevation which in the anterior region is median in position but in the posterior somites is toward the caudolateral corner. Anal plate large, triangular, pointed behind, densely tuberculate. Anal scale trapeziform, with two widely separated setigerous tubercles.

Type.— *M. haitianus,* sp. nov.

212. MESETHODESMUS HAITIANUS, sp. nov.

Type.— M. C. Z. 4,532. ♀. *Paratypes.*— M. C. Z. 4,533. ♀. Haiti: Furcy. W. M. Mann.

General color above light brown, the caudal row of tubercles commonly pale. First tergite with a large yellowish area on each side. Head yellow. Antennae yellow proximally, dilute brownish distally. Venter and legs yellow.

Head above very finely granular, with numerous very short, fine hairs. Antennae strongly thickened distad; the sixth article especially enlarged elevated on the dorsal side, those proximad of this elevated progressively less in going toward the base.

First tergite somewhat semicircular, the caudal margin slightly convex on each side, mesally emarginate; scarcely narrower than the head with mandibles, broader than head without; obviously narrower than the second tergite. The second and immediately succeeding somites also on caudal border emarginate toward middle, the median length obviously shorter than that toward the sides. Caudal corners much rounded in anterior tergites, but becoming quadrate in the posterior ones. Tubercular setae very long.

Length, 6.5 mm.; width .8− mm.

EURYURIDAE.

212a. APHELIDESMUS DIVERGENS sp. nov.

Type.— M. C. Z. 4,534. Trinidad: Arima, Verdant Vale. Roland Thaxter. *Paratypes.*— M. C. Z. 4,535–4,540. Tobago: Milford Bay, Richmond Bay, King Bay, Plymouth, Scarboro. H. L. Clark.

This species seems to be readily separable from those previously described, all from Central America and northern South America, in the structure of the male gonopods. These are segmented as usual; the distal division is geniculate toward its base with the plate-like division thin and nearly transparent, subcircularly expanded or broadly oblong and distally rounded, concave on the dorsal side; from its base on the ectal side a much more slender branch which is bidentate at tip; on the mesal side of the proximal end of the tarsal or distal division a membranous extension or sheath by which the seminal style is protected. A short rounded process on ectal side near origin of style.

The prozonites are dusky chestnut or chocolate-brown, the metazonites black in individuals in full color, excepting the keels which are bright yellow. Head also deep black of weak chestnut cast excepting the labrum and a triangular elevated region extending dorsal between the antennae, this region being light brown. Legs and antennae pale brown.

Head smooth. Vertigial sulcus distinct as usual. Sixth article of antennae longest, the second, third, fourth, and fifth nearly equal to each other.

Anterolateral corners of keels widely rounded. Lateral margin emarginate at level of pores, not toothed.

Last tergite broad and plate-like, narrowed caudad with the caudal margin widely convex, mesally emarginate as in *A. glaphyros* and *A. hermaphroditus.*

Length of the type (male), 32 mm.; width, 5.6 mm.

212b. POLYLEPISCUS RORERI, sp. nov.

Type.— M. C. Z. 4,576. Trinidad: Mt. Tucutche. In a bromeliad. J. B. Rorer.

This is the first representative of the Central American Polylepiscus to be recorded from the West Indies. In comparison with the Central American species it falls with the forms under 65 mm. in length and agrees with *P. stolli* in having the polygonal areas wholly smooth. From that species it may be distinguished, *e. g.* in having the keels of the tenth and eleventh plates much less strongly produced caudad.

It is apparently a much darker species. The prozonites black above and down the sides, becoming light brown ventrally. The anal valves are also black as is also the anal scutum excepting across its distal end. The metagonites are black over the keels and in a narrow stripe along the anterior edge, elsewhere being dilute ferruginous brown. The antennae are fuscous, the legs dilute yellowish brown. Head and first tergite black or nearly so, the former paler across labrum and the latter along caudal border.

While the collum is nearly smooth in the median region, it is strongly sculptured on the sides; short longitudinal sulci outline a row of areas along the caudal border, while areas along the anterior border are less distinctly outlined. On subsequent tergites the polygonal areas are outlined entirely across but on the first ones are much more strongly developed down the sides and over the keels than on mid-dorsal region, the areas becoming more sharply defined caudad. Keels with anterior angles rounded, anterior margin smooth, not at all serrulate as in *P. stolli;* the caudal margin weakly and irregularly crenulate; the posterior processes similar to those of stalli but shorter, this being especially noticeable on the segments of the median region. Processes of eighteenth and nineteenth segments spiniform, acute, those of the latter not apically blunt as they are in *P. stolli.* Pores of nineteenth segment more strictly lateral than those of preceding somite.

Length (♀), about 55 mm.; width, 7.5 mm.

Distribution.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
CHILOPODA																															
Cryptops bivittatus																											—				
manni												⊕																			
cornifer							⊕																								
Otocryptops ferrugineus		+					+	+			+	+										+		+	+		—		+		
melanostomus												+	—														—				
Scolopocryptops miersii												+													—						
Newportia ernsti												+															—				
longitarsis							+					+															—		+		
pusilla																											—				
cubana							⊕																								
heteropoda							⊕																								
Tidops simus																													⊕		
Otostigmus spiculifer																											—				
occidentalis												⊕																			
caraibicus													—		—																
Rhysida longipes																—			—												
celeris		+									+																				

— = Record. + = M. C. Z. ⊕ = M. C. Z. Type.

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Rhysida nuda	. .	. .	. .	. .	. .	. .	+	. .	. .	. .	. .	+																			
aspera	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−																				
Cupipes guildingi	. .	. .	. .	. .	. .	. .	. .	. .	. .	+	+	+	. .	−	. .	. .	−	. .	. .	. .	. .	. .	. .	−	. .	. .	−		+		
lineatus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−				
Scolopendra gigantea	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−	. .	. .	. .	−																
angulata	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−				
viridicornis	. .	. .	. .	. .	. .	−																									
viridis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+																				
alternans	. .	+	+	. .	+	. .	+	+	. .	. .	. .	+	. .	. .	−	−	−	−	−	−	−	+									
hisutipes	−																														
morsitans	. .	+	. .	. .	. .	. .	. .	. .	. .	. .	. .	+	+	. .	. .	. .	. .	. .	+												
subspinipes	. .	. .	. .	. .	. .	. .	+	. .	. .	. .	+	+	+	. .	+	−	−	. .	+	−	−	−	−	−	. .	. .	−	. .	. .	−	
Pectiniunguis insulanus	. .	. .	. .	. .	. .	. .	+																								
Adenoschendyla pauperata	. .	. .	. .	. .	. .	−																									
Pleuroschendyla nesiotes	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
Notiphilides maximiliani	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	−		
Orphnaeus brevilabiatus	. .	. .	+	. .	. .	. .	−	. .	. .	. .	−																				
Titanophilus maximus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Titanophilus fratrellus												⊕																			
Nesidiphilus marginalis		+					+				+																				
latus											⊕																				
montis							⊕																								
juvenis												⊕																			
Telocricus cubae							⊕																								
frater							⊕																								
major							⊕																								
multipes												⊕																			
hyper							⊕																								
Lestophilus haitiensis												⊕																			
nesiotes												⊕																			
Piestophilus tenuitarsis																								—							
Geophilus mustiquensis																												—			
culebrae														—																	
Mecistocephalus guildingi							—				+	+				—											—				
Taeniolinum setosum																											—				

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Gonethelia nesiotes	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																					
Gonethina grenadensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕		
Pselliophora flavipes	. .	. .	+	—																											
pulchritarsis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																			
cubensis	. .	. .	. .	. .	. .	. .	⊕																								
minor	. .	. .	. .	. .	. .	. .	⊕																								
haitiensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
?Scutigera guildingi	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	.	—				
?superba	—																														
DIPLOPODA																															
Glomeridesmus marmoreus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—				
grenadanus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.	. .	. .	. .	. .	. .	. .	⊕		
concolor	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
Siphonophora portoricensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	.	—																		
cubana	. .	. .	. .	. .	. .	. .	—																								
tenuicornis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—				
proxima	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
gracilior	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Siphonophora manni	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
robusta	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																				
Siphonotus purpureus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—				
Prostemmiulus compressus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																		
wheeleri	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																	
clarus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
cubae	. .	. .	. .	. .	. .	. .	⊕																								
robustus	. .	. .	. .	. .	. .	. .	⊕																								
Epinannolene dominicana	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—							
cubensis	. .	. .	. .	. .	. .	. .	—																								
haitiensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
ornata	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
grenadae	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕		
Orthoporus ventralis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																
sculpturatus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																		
abstemius	. .	. .	. .	. .	. .	. .	—																								
antillanus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	?–		

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St Vincent	Mustique	Grenada	Barbados	Union
Orthoporus grenadae	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·		·	⊕		
haitiensis	·	·	·	·	·	·	·	·	·	·	·	⊕																			
?indus	·	·	·	·	·	·	·	·	·	·	·	|																			
Rhinocricus ramagei	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	|					
mandevillei	·	·	·	·	·	·	·	·	·	·	+																				
politus	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	|											
townsendi	·	·	·	·	·	·	·	·	·	·	|																			
gossei	·	·	·	·	·	·	·	·	·	·	|																			
rarior	·	·	·	·	·	·	·	·	·	·	·	⊕																			
excisus	·	·	·	·	·	·	·	·	·	·	|																			
newtonianus	·	·	·	·	·	·	·	·	·	·	⊕																				
parcus	·	·	·	·	·	·	·	·	·	·	·	·	|																	
electus	·	·	·	·	·	·	⊕																								
mediator	·	·	·	·	·	·	·	·	·	·	·	⊕																			
guadeloupensis	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	⊕									
holomelanus	·	·	·	·	·	·	·	·	·	·	+																				
chazaliei	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	|					
liparus	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	⊕						
solitarius	·	·	·	·	·	·	·	·	·	·	|																			
parvior	·	·	·	·	·	·	·	·	·	·	⊕																				

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Rhinocricus furcianus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
domingensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																			
maltzani	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	+																			
haitensis	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	—																			
suprenans	. .	. .	. .	. .	. .	. .	⊕																								
duvernoyi	. .	. .	. .	. .	. .	. .	+																								
curtior	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
heteroscopus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																				
nigrescens	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																			
socius	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	. .	⊕		
gracilipes	. .	. .	. .	. .	. .	. .	—																								
grenadensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	—		
arboreus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—	—	+	—	. .	. .	. .	—											
gundlachi	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																		
krugii	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—																		
macropus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—				
leptopus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	—					
barbouri	. .	. .	. .	. .	. .	. .	. .	⊕																							
thomasianus	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	⊕																
martiniquensis	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .		. .	. .	. .	. .	. .	. .	⊕						
leucostigma	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	. .	—					

Distribution.—Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Rhinocricus monilicornis												+																		|	
juxtus																													⊕		
consociatus																															|
anguinus																										|					
grammostictus																										|					
vincenti																											|				
bruesi											⊕																				
cockerelli											+																				
sabulosus											|																				
Nesobolus toroanus							⊕																								
Thyroproctus townsendi											|																				
cinchonianus											⊕																				
Cubobolus beliganus							⊕																								
Microspirobolus marmoratus													|																		
insularis													|																		
belonanus							⊕																								
fontis							⊕																								
lineatus												⊕																			
Cairibolus antonianus											⊕																				
leiosuturus													⊕																		
Trigoniulus lumbricinus												+	+				|							|		|				

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Trigoniulus garmani																									⊕						
Spirostrophus naresi																						—									
Julus curiosus													—																		
caesar													—																		
Cyclodesmus porcellanus											—																				
hubbardi											—																				
haitianus												⊕																			
bruesi											⊕																				
Platyrachus luciae																										—					
?maculatus							—																								
Docodesmus vincenti																											—				
haitiensis												⊕																			
parvior												⊕																			
grenadae																													⊕		
Chytodesmus laqueatus							—																								
Tridesmus sectilis													—																		
portoricensis													—																		
Iomus incisus													—																		

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Iomus platanus													—																		
obliquus													—																		
Trescolobus caraibianus												⊕																			
granulofrons												⊕																			
Cynedesmus ornamentatus							—																								
Styraxodesmus furcatus												⊕																			
Homodesmus parvus												⊕																			
Amphelictogon cubanus							⊕																								
rubripes							⊕																								
obscurus							⊕																								
dentatus							⊕																								
zygethus							⊕																								
pallidipes							⊕																								
guantanamanus							⊕																								
flavipes							⊕																								
juvenis							⊕																								
maculatus							⊕																								
manni												⊕																			
bahamiensis			⊕																												
couloni							—																								

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Amphelictogon subterreanus							—																								
Caraibodesmus bruesi											⊕																				
insignis												⊕																			
pellus											⊕																				
tuberculatus											—																				
morantus											—																				
verrucosus											—																				
formosus											—																				
mammatus											—																				
?sallei						—						—	—																		
?magnus							—																								
?mauriti													—																		
Antillodesmus grenadanus																													⊕		
vincenti																											—				
Cubodesmus ramsdeni							⊕																								
latior							⊕																								
proximus							⊕																								
pelopleurus							⊕																								
princeps							⊕																								
limoneus							⊕																								
Ellipodesmus simplex												⊕																			

Distribution — Continued.

	West Indies	New Providence	Andros	Watlings	Great Inagua	Antilles	Cuba	Isle of Pines	Grand Cayman	Cayman Brac	Jamaica	Haiti & S. Domingo	Porto Rico	Culebra	St. Thomas	St. Croix	St. Bartholomew	St. Eustatius	St. Kitts	Antigua	Montserrat	Guadeloupe	Marie Galante	Dominica	Martinique	St. Lucia	St. Vincent	Mustique	Grenada	Barbados	Union
Tomodesmus thaumastus	. .	. .	. .	. .	. .	. .	⊕																								
Orthomorpha coarctata	. .	.	.	. .	. .	. .	+	. .	+	. .	+	+	—	. .	. .	. .	.	.	.	.	. .		. .	—	. .	. .	.	. .	—	—	—
Strongylosoma semirugosum	. .	. .	. .	. .	. .		. .	. .	. .	.	. .	.	. .	.	. .	. .	. .	. .	. .	. .	. .	.	. .	—							
Lasiodesmus caraibicus	. .	. .	. .	. .		. .	. .	. .	. .	. .	. .	. .	—																		
Mesethodesmus haitianus		.	. .	. .	.	.	. .	. .	.	.	. .	⊕																			

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BRITTLE-STARS, NEW AND OLD.

By Hubert Lyman Clark.

With Eight Plates.

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No. 6.— *Brittle-Stars, New and Old.*

BY HUBERT LYMAN CLARK.

SINCE the publication in December, 1915, of the catalogue of brittle-stars in the Museum collection, (Mem. M. C. Z., **25**) there have been considerable accessions, including a number of species apparently undescribed. These accessions have come chiefly from four sources:—(1) Mr. Joseph Gabriel, Melbourne, has continued his generous donations of echinoderms from the coast of Victoria; (2) Dr. Lawrence E. Griffin, Pittsburgh, formerly of Manila, presented a large series representing 38 species from the Philippine Islands; (3) the present writer collected nearly fifteen hundred specimens of 36 species at Pigeon Point, Tobago, in March and April, 1916, while working in the Carnegie Institution's marine laboratory at that place; (4) a similar collection of 36 species was made at the Tortugas, Fla., in June, 1917, while at the Carnegie Institution's laboratory on Loggerhead Key. Thanks are herewith extended to Dr. Alfred G. Mayer for the opportunity of making these two collections and for permitting the publication of this account of the more important species obtained.

While identifying the specimens of Ophiophragmus, Ophionephthys, Ophiactis, and Ophiopsila from Tobago and the Tortugas, it became necessary to make a careful revision of the previously known species in those genera and the results are published here. I therefore give artificial keys and a full synonymy, accompanied by a statement of the geographical distribution of each accepted form.

OPHIACANTHIDAE.

OPHIACANTHA OLIGACANTHA, sp. nov.

ὀλίγος = few + ἄκανθα = a spine, in reference to the small number of arm-spines.

Plate **7**, fig. 5.

Holotype.— M. C. Z. 4,214. Florida: Dry Tortugas, Garden Key, June, 1917, in coralline Algae along shore. Carnegie Expedition. H. L. Clark coll.

Disk 3 mm. in diameter; arms *six*, 15 mm. long. Disk covered by a close coat of thin, overlapping scales, many (but by no means, all) of which bear thick, cylindrical, rough-pointed spinelets; there is never more than one spinelet to a scale; the spinelets are rather longer than the diameter of the scale but are seldom equal to twice that length; altogether there are about 100–125 spinelets on the disk. Radial shields can be detected only with difficulty; they are widely separated and the visible portion, which is triangular, is little larger than a disk-scale. Upper arm-plates with proximal half V-shaped and distal half semicircular; they are about as wide as long, and are barely in contact proximally but become more and more separated distally. Interbrachial areas below covered by a coat of thin scales, like those on the disk, but very few bear spinelets and they are near margin. Genital slits relatively large. Oral shields shaped much like the upper arm-plates but the distal margin is not so evenly rounded and the proximal sides are not quite so straight. Adoral plates rather long, meeting interradially; width of distal end about half length, and proximal end about half as wide as distal. Oral plates relatively large and distinct, triangular, each with 4 oral papillae of which the distalmost is longest and widest and the proximalmost is thickest; no oral papillae on adoral plate. At tip of jaw are 2 or 3 tooth-papillae similar to proximalmost oral papillae but they may be both longer and stouter. First under arm-plate small, nearly triangular, with the blunt distal angle, separating the adoral plates; second plate shield-shaped, a trifle wider than long, with rather sharp lateral angles; succeeding plates, longer than wide, pentagonal with distal angles rounded and lateral margins slightly concave; they are in contact, though barely so, beyond middle of arm. Side arm-plates rather large, the distal margins thickened as a moderately conspicuous spine-bearing ridge; each plate carries 3 (basally there may be 4) straight, bluntly pointed, nearly smooth, hollow arm-spines; uppermost (except when 4 are present) longest, equal to an arm-segment and a half. Tentacle-scale single, large, flat and only bluntly pointed. Color yellow-brown; disk paler; there are indefinite deep dusky bands at intervals of two or three segments on basal half of arm; distally there are no markings.

This little specimen was the only representative of its family found at the Tortugas. It is well-characterized by the number of arms, the number and appearance of the arm-spines, the oral and tooth-papillae and the upper arm-plates. The color has undergone little change in preservation. Its nearest relative would seem to be *O. ophiactoides*

H. L. C. of Porto Rico, which it resembles in having six arms. I have been strongly tempted to refer it to that species, but the differences in the arms, arm-spines, oral shields, and mouth-parts seem to me too great to be accounted for either as age differences or as individual diversity. It is of course possible that both the Porto Rican and Florida specimens are the young of an as yet unknown adult but in the absence of specimens, it seems better not to assume that.

AMPHIURIDAE.

Amphiura constricta.

Lyman, 1879. Bull. M. C. Z., 6, p. 22.

Mr. Gabriel has sent us nine specimens from Westernport, Victoria, secured by dredging in shallow water. None of these specimens is quite so large as Lyman's type, which was from Port Jackson, but they are not notably different in any other particular.

Amphiura glabra.

Lyman, 1879. Bull. M. C. Z., 6, p. 25.

After some hesitation, I have referred to this species, an amphiuran in Dr. Griffin's Philippine collection taken at Port Galera, Mindoro. No depth is given but all the specimens from Mindoro were taken in shallow water. Lyman's type of *A. glabra* was taken south of the Philippines in 500 fms. and it is hard to believe that the same species occurs in very shallow water. The Mindoro specimen, however, differs very little from Lyman's description and figure and these differences may be due to the fact that the specimen is dry. Thus the disk is less than five millimeters across while the arms when unbroken were at least 30 mm. long; in the type the disk was relatively much bigger. The radial shields are noticeably longer and narrower in the Mindoro specimen than in Lyman's figure, the disk-scaling is much finer and the basal upper arm-plates are slightly different. Orally there are no tangible differences. Under the circumstances it seems to me better to refer the Mindoro specimen to *A. glabra* than to make it the type of a new species.

AMPHIURA POECILA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 230.

Mr. Gabriel has found this species not uncommon at Westernport, Victoria, in company with *A. constricta* and has sent nine specimens, all of which are smaller than the type and none has the purple variegation of the upper arm-plates, from which the species received its name. Whether this lack of color is due to bleaching in the alcohol, there is no means of determining. It may be due to youthfulness, or the coloration of the holotype may be a matter of individual diversity.

AMPHIURA STIMPSONII.

Lütken, 1859. Add. ad Hist. Oph., pt. 2, p. 116.

We dredged at the Tortugas in 7–8 fms. a brittle-star with the disk 6 mm. across which resembles *A. stimpsonii* so closely in all details of structure that it must be the adult of that species, the largest specimen of which, hitherto known, is only 4 mm. across the disk. The Tortugas specimen is also notable for its coloration; a very pale yellow with a longitudinal stripe of bright orange on the upper surface of each arm; this stripe has faded greatly since preservation. There are as a rule 6 arm-spines, with 7 on one or two joints. The arms are all broken.

AMPHIURA VIVIPARA, sp. nov.

Plate **1**, fig. 1, 2.

Holotype.— M. C. Z. 4,129, and numerous *Paratypes,* M. C. Z. 4,130, 4,189. British West Indies: Tobago, Buccoo Bay, April, 1916, in coralline Algae and among coral fragments. Carnegie Expedition. H. L. Clark coll.

Disk, 3.5 mm. in diameter; arms five, about 18 mm. long. Disk covered by a coat of fine, much overlapping scales, among which the primaries can be distinguished with some difficulty; there are about a dozen series of scales in the interradial areas at the narrowest point; the interbrachial areas below are covered by a close coat of equally fine scales. Radial shields not quite equal to half the radius of the disk, narrow, the width only one third to one half the length; distally they are usually in contact but proximally they are separated by a wedge of relatively coarse scales. Upper arm-plates broadly oval, but proximally truncated, wider than long, in contact, except near tip of arm, where they gradually become longer than wide and separated from each other. Oral shields pentagonal, with proximal angles rounded, about as wide as long; madreporite elliptical, much wider than long. Adoral plates large and long, twice as wide at outer (radial) ends as at inner, broadly in contact interradially, but radially well-separated by first under arm-plate. Oral plates very small, not so large as the big oral papilla they bear. Oral papillae two on each side; one, the large block-like terminal one on the oral plate, the other, a cylindrical (or slightly flattened), blunt, spine-like papilla on the inner end of the adoral plate; the papilla guarding the first oral tentacle is very conspicuous and might easily be mistaken for an additional oral papilla but it lies on the side of the jaw at a higher level and is morphologically different. First under arm-plate quite small, somewhat pentagonal, about as wide as long; succeeding plates more or less tetragonal with rounded angles, lateral margins slightly concave, longer than wide, broadly in contact. Side arm-plates rather small, but each carries 5 (or, further out, 4) subequal spines as long as the arm-segment; these spines are blunt, thickened at base and only a little rough at tip. Tentacle-scale, usually single, well-developed, situated on side arm-plate, close to the under arm-plate; occasionally a second scale is developed situated on the lateral margin of the under arm-plate; in young specimens and distally in adults, the tentacle-scale may be wanting. Color, in life and in dried specimens, disk, grayish usually with a few blackish spots near center; arms and lower surface, pale yellowish; upper arm-plates on distal half of arm often with a dusky spot, giving the appearance of indistinct banding; arm-spines frequently dusky or with a dusky spot.

An interesting variety, which seems to be rather rare, has the arms annulated with red. This red is in the form of a very narrow line along the proximal margin of the side arm-plates. The line does not show on the ventral surface of the arms. It is well-marked dorsally and in life is quite noticeable but in preserved material the red gradually fades and probably will ultimately disappear. This color-form may be known as

AMPHIURA VIVIPARA ANNULATA, var. nov.

Holotype.— M. C. Z. 4,131, and *Paratype*, M. C. Z. 4,132. With the typical form; same date and collector. A single well-marked example of this variety was found at the Tortugas, June, 1917.

In size and superficial appearance, this little ophiuran is so much like *Amphipholis squamata,* it was not until the mouth-parts were examined that it was seen to be a true Amphiura. The further discovery, which soon followed, that it is viviparous proved to be of much interest and Dr. Mortensen secured an abundance of material for the study of the development. Of previously known members of the genus, *A. stimpsonii* seems to be as near as any to *A. vivipara* and young *A. stimpsonii* are very close. But the shorter and more slender arms, the fewer, shorter, and differently shaped arm-spines and the shorter and wider upper arm-plates seem to be constant differences by which *A. vivipara* may be distinguished from even very young *A. stimpsonii.*

This species swarms in the coralline Algae of Buccoo Bay, along with two or three species of Ophiactis. I also found it common at the Tortugas, Fla., in June, 1917. There is more or less diversity in the yellowness of the coloration, for while the great majority are very pale, distinctly yellow specimens sometimes occur. There is also diversity in the duskiness of the arm-spines, for they may be very distinctly marked, though as a rule they are uniformly whitish or simply clouded with dusky.

OPHIOPHRAGMUS.

Although this is not a large genus, its real character has been misunderstood and a number of species have been referred to it erroneously. Lyman instituted the genus for three species described as Amphiura but which differed from typical members of that genus and agreed with each other in several important characters. Of these characters the one on which he laid most stress, and from which the name of the genus is derived, is the occurrence of a series of papillae along the margin of the disk in the interradial areas. Duncan, Matsumoto, and others have failed to recognize the important difference between this series of marginal papillae and the marginal "fence" which occurs in some species of Amphiura, formed by the upturned margins of the uppermost series of plates on the oral interbrachial areas. This "fence" is well-developed in "*Ophiophragmus*" *japonicus* Matsumoto but is not at all like the "fence" in true Ophiophragmus, where it is composed of distinct papillae or spinelets. These may, of course, be simply modified marginal scales but their appearance is obviously different.

More than a dozen species have been referred to Ophiophragmus.

Of these I have examined specimens of nine. I have compared these critically with each other and with the figures and descriptions of the remaining species, and am satisfied that Ophiophragmus is a natural group of tropical American amphiurans of which there are at present known eight species.

The following table shows the conclusion reached regarding each of the forms hitherto referred to Ophiophragmus.

affinis Duncan, 1887. An Amphioplus, identical with *A. relictus* Koehler.

andreae Matsumoto, 1915. Described by Lütken as *Amphipholis andreae*, seems to be an Amphioplus.

antarcticus Ljungman, 1867. Position doubtful; the minute disk-scales and small radial shields are against its being an Ophiophragmus; probably an Amphiodia.

brachyactis H. L. Clark, 1915. ?Valid.

difficilis Duncan, 1887. Position doubtful; probably an Amphioplus but much like Ophionephthys in important particulars.

echinatus Ljungman, 1867. An Ophiocnida.

gibbosus Ljungman, 1867. Position doubtful; the 4 oral papillae indicate an Amphioplus.

hispidus Ljungman, 1867. Described by Leconte as *Ophiolepis hispida;* seems to be an Ophiocnida.

japonicus Matsumoto, 1915. An Amphioplus.

loveni Ljungman, 1867. An Ophiocnida.

marginatus Lütken, 1859. ?Valid. Described as an Amphiura.

periercta Matsumoto, 1915. Described by H. L. Clark as *Amphiodia periercta;* in that genus, I still think it belongs.

praestans Matsumoto, 1915. Described by Koehler as *Amphiura praestans;* seems to be an Amphioplus.

scabriusculus Ljungman, 1867 Described by Lütken as *Amphiura scabiuscula;* seems to be an Ophiocnida.

septus Lütken, 1859. Valid. Described first as an Amphiura.

wurdemanii Lyman, 1860. Valid. Described first as an Amphiura.

There are four species, not hitherto referred to Ophiophragmus, which unquestionably belong there. These are *Amphipholis lütkeni*, Ljungman, *Ophiocnida filogranea* Lyman, *Amphipholis erecta* Koehler and *Ophiolepis chilensis* M. & T. The first and third of these have been admirably described and figured by Koehler, (1914. Bull. 84 U. S. N. M., p. 67–70, pl. 6) and specimens of each were taken in Buccoo Bay, Tobago in April, 1916. Study of my Tobagoan material soon convinced me that both species belong to Ophiophragmus and that they are quite distinct from each other and from *O. wurdemanii* also. But I have not been able to find any differences between *O.*

erecta and Lütken's *Ophiophragmus septus* described in 1859. I think therefore that Koehler's specific name must be considered a synonym of Lütken's.

There are in the M. C. Z. collection some beautifully preserved specimens, young and adult, of *Ophiocnida filogranea* Lyman, collected by Mr. George M. Gray in 1915, at Port Tampa, Florida. These specimens, the largest of which is almost exactly like the holotype of *O. filogranea*, agree surprisingly well with typical *Ophiophragmus wurdemanii*, except in one particular, the covering of the interbrachial areas below. There is not the least doubt that they are congeneric with *O. wurdemanii* and they might almost be regarded as only a variety of that species. But until an intermediate specimen is found, the specific distinctness may be maintained. As for *Ophiolepis chilensis* M. & T., the reasons which have compelled its transfer to Ophiophragmus are given in detail (p. 277). Finally, I found an undescribed species of the genus at the Tortugas in June, 1917.

Although there can be no doubt that Ophiophragmus is very closely related to Amphiodia, it seems desirable to recognize it as a separate genus. It is characterized by the presence of the following combination of characters: — Disk-scales moderately to quite coarse, thick; margin of disk with a more or less developed series of erect papillae; upper arm-plates broadly in contact, two — six times as wide as long; oral papillae three on each side, the distal one widest, the proximal thick and block-like, as in Amphiura; under arm-plates more or less tetragonal; arm-spines, three; tentacle-pores large; tentacle-scales two, one on under arm-plate and one on side arm-plate, often separated from each other because of the large size of the tentacle. As thus defined the genus is known only from the Caribbean region (north to North Carolina, south to Tobago), and from the western coast of Central and South America. The species may be distinguished from each other as follows: —

KEY TO THE SPECIES OF OPHIOPHRAGMUS.

- *a* Arms long, 6–17 times disk-diameter; 9–15 series of scales in interradial areas at narrowest point.
  - *b* Basal under arm-plates wider than long.
    - *c* Marginal papillae of disk, thick, blunt, not spiniform.
      - *d* Arms slender, 10–17 times disk-diameter.
        - *e* Radial shields broad, length only 1–2 times width; 9–12 series of scales in interradial areas; no longitudinal stripe on lower surface of arm.

- *f* Basal under arm-plates noticeably swollen; no longitudinal stripe on upper surface of arms.
  - *g* Oral surface of interbrachial areas covered by numerous small, thick scales........................*wurdemanii*
  - *g′* Oral surface of interbrachial areas with scales largely concealed under a coat of granules.............*filograneus*
- *f′* Basal under arm-plates not at all swollen; a conspicuous longitudinal stripe on upper side of arm................*pulcher*
- *e′* Radial shields narrow, length 2–3 times width; 12–15 series of scales in interradial areas; conspicuous longitudinal stripe on lower side of arm.................................*septus*
- *d′* Arms stout, only 6–9 times disk-diameter..............*chilensis*
- *c′* Marginal papillae of disk spinulose and very acute..........*lütkeni*
- *b′* Basal under arm-plates longer than wide.....................*marginatus*
- *a′* Arms short, only 4–5 times disk-diameter; only 5–7 series of scales in interradial areas where narrowest.........................*brachyactis*

OPHIOPHRAGMUS WURDEMANII.

Amphiura wurdemanii Lyman, 1860. Proc. Boston soc. nat. hist., 7, p. 196.
Ophiophragmus wurdemanii Lyman, 1865. Illus. cat. M. C. Z., no. 1, p. 12, 132.
Ophiophragmus wundermani Koehler, 1915. Bull. 84 U. S. N. M., p. 42, pl. 8, fig. 1, 2.

It is unfortunate, of course, that Koehler has consistently misspelled the specific name of this species in his brief note on its occurrence at Trinidad. His figures also are unsatisfactory as they differ from all M. C. Z. specimens of *O. wurdemanii* in the indistinctness of the marginal papillae and in the shape of both upper and under arm-plates. The upper arm-plates in typical *O. wurdemanii* are excessively wide in comparison to their length, and are in contact with each other for practically the full width. According to Koehler's figure, the upper arm-plates of his Trinidad material are only 2.5 times as wide as long and are in contact for only about .60 of their width. I did not find *O. wurdemanii* at Tobago, nor have I collected it at Jamaica. It is known from Beaufort, N. C., and from the western coast of Florida. The holotype (M. C. Z., 1,119) is evidently an old individual and the tentacle-pores are very large indeed. As a result the tentacle-scale on the side arm-plate is often far removed from the one on the under arm-plate; it is also often reduced in size and not infrequently is wanting; rarely there are three tentacle-scales, the extra one being on either the side arm-plate or on the under arm-plate.

OPHIOPHRAGMUS FILOGRANEUS.

Plate 2, fig. 4, 5.

Ophiocnida filogranea Lyman, 1875. Illus. cat. M. C. Z., no. 8, pt. 2, p. 20, fig. 88, 89.

This species is surprisingly similar to typical *O. wurdemanii* in all essential features save the covering of the interbrachial areas below, a resemblance, which curiously enough, Mr. Lyman seems to have entirely overlooked. The lower interbrachial areas are, as usual, covered by a coat of numerous, thick, overlapping scales, but, except along the margins of the genital slits and near the oral shields, the scales are concealed beneath a dense covering of granules; towards the mouth, these granules are nearly spherical but they become more elongated distally and just below the marginal papillae, where they are like those papillae in form but much smaller, they are cylindrical and about three times as long as thick. All of the M. C. Z. specimens agree in the possession of the granules, which are totally wanting in all available specimens of *O. wurdemanii.* The smallest *O. filograneus* before me has the disk only 3 mm. across but the marginal papillae are well-developed and the granules distinctly evident. The arms of this specimen exceed 50 mm. in length or more than 17 times the disk-diameter. The species is known only from Cedar Keys, and Port Tampa, Florida. At the latter place, Mr. George M. Gray collected many specimens in the winter of 1915; he found them burrowing in the mud.

OPHIOPHRAGMUS PULCHER, sp. nov.

pulcher = beautiful, in reference to the notable coloration.

Plate 8, fig. 1.

Holotype.— M. C. Z. 4,210, and four *Paratypes,* M. C. Z. 4,215. Florida: Dry Tortugas, near Loggerhead Key, June, 1917, in 5–7 fms. and on Bird Key reef-flat in mud, in 2–3 ft. of water. Carnegie Expedition. H. L. Clark coll.

Disk 7.5 mm. in diameter; arms 75–80 mm. long. Disk covered by a coat of moderately coarse scales, about 9 or 10 series at the narrowest part of the interradial area; along the disk-margin in each interradial space, are 5–8 conspicuous erect papillae similar to those in *O. septus* and *O. wurdemanii.* Radial shields moderate, each about 1.5 mm.

long and .80–.85 mm. wide; they are closely joined except at inner end where a couple of scales intervene. Upper arm-plates twice as wide as long or wider, in contact for their full width or nearly so. Interbrachial areas below covered by scales very similar to those of the upper surface of disk but somewhat finer. Genital slits long but inconspicuous. Oral shields spearhead-shaped with rounded angles, distinctly longer than wide. Adoral plates very small, not meeting in interradii, triangular with inner side concave. Oral plates small. Oral papillae three on each side, the distalmost largest and borne on the adoral plate. First under arm-plate moderately large, not swollen, the proximal side narrowed to a rounded point, the distal side rounded; succeeding plates wider than long, the distal margin concave, the proximal convex but not enough so to make the plate pentagonal; the plates are all broadly in contact but are perfectly flat and not at all swollen. Side arm-plates quite small, low and short; each carries three flattened, blunt subequal arm-spines, about as long as an arm-segment. Tentacle-scales two, one on the under arm-plate, the other on the side arm-plate, but in close contact with each other. Color, in life, disk uniform light gray; arms yellowish white; at intervals of 4–6 segments, one or two upper arm-plates are bright green, and there is also a narrow longitudinal stripe of green running the whole length of the arm but rather faint proximally. In young specimens, the longitudinal stripe is bright orange-red and this may perhaps persist in some adults. Oral surface nearly white, but certain under arm-plates are dusky or (distally) greenish or bright green; these colored plates correspond in position to the colored upper arm-plates. In preserved specimens, the green shades are duller than in life and the orange fades and will probably disappear.

This is one of the handsomest of the brittle-stars found at the Tortugas, young specimens being particularly fine with their combination of white, green, and orange-red. The smallest specimen is less than three mm. across the disk and the arms do not much exceed twenty mm., but the marginal papillae are relatively larger and more numerous than in the adults. The sharply banded appearance of the arms give this Ophiophragmus a characteristic facies quite different from that of any other member of the genus, which I have seen.

OPHIOPHRAGMUS SEPTUS.

Amphiura septa Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 120.
Ophiophragmus septus Lyman, 1865. Illus. cat. M. C. Z., no. 1, p. 132.
Amphiodia erecta Koehler, 1915. Bull. 84 U. S. N. M., p. 67, pl. 6, fig. 4–7.

As Lütken gave no figures, Koehler's photographs are very useful, and his fig. 6 is particularly satisfactory as it shows the longitudinal stripe on the arm, which is referred to in Lütken's description and is well-marked in all my Tobagoan specimens. The absence of this stripe in the smaller specimen figured by Koehler (fig. 4) is probably due to the long sojourn in alcohol. The character of the marginal papillae of the disk is well brought out in Koehler's fig. 4, 5. Koehler's specimens were from off Cape Hatteras while Lütken's type was from St. Thomas. At Tobago I found this species in the sandy mud on the southeastern side of Sandy Point, Buccoo Bay, in company with *O. lütkeni* and several species of related genera. It was not common but three entire specimens and the arm of a fourth were secured. The smallest is 2.5 mm. across the disk and has arms 23 mm. long, while the largest has the same measurements 9 and 90 mm. respectively. In all the specimens the coloration was the striking feature in life for while the disk was gray, the ground-color of the arms was pale yellowish, more or less clouded or blotched with yellowish green and the longitudinal stripe on the dorsal side of the arm was a distinctly deeper green. In the preserved specimens the green is fading and becoming more or less dusky. All these individuals had a similar but fainter stripe on the under side of the arm but this has now nearly disappeared in the smallest specimen, though still obvious in the others.

OPHIOPHRAGMUS CHILENSIS.

Ophiolepis chilensis Müller and Troschel, 1843. Arch. f. naturg., **9**, 1, p. 120.
Amphiura chilensis Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 122.
Amphiodia chilensis Verrill, 1899. Trans. Conn. acad., **10**, p. 313.

The discovery that this species belongs in Ophiophragmus was due to the critical examination of the Amphiodias, in connection with the description of a new species of that genus taken at Tobago. There are in the M. C. Z. collection two brittle-stars from Chile, which were labeled *Amphiodia chilensis;* one, the specimen collected by the HASSLER at Talcahuano, the other a somewhat larger specimen collected by Plate at Calbuco and received, in exchange, from the Berlin Museum. The latter has an imperfectly developed "fence" of marginal papillae, just like that of *O. wurdemanii*, but the papillae are thicker and more capitate than in the Florida species. There is no doubt that this Calbuco brittle-star is an Ophiophragmus, if the genus is to be maintained. Close comparison of the Calbuco and Talcahuano specimens shows convincingly that they are the same species. There is absolutely no other tangible difference than the complete absence of marginal papillae in the Talcahuano specimen. The latter, Lyman states (1875, Illus. cat. M. C. Z., no. 8, pt. 2, p. 20) "agrees well" with Müller and Troschel's type at Berlin. No doubt the Calbuco specimen has also been compared with that type. There is no reason therefore for doubting the identification of these brittle-stars. The real problem is as to the significance of the marginal papillae in the largest specimen. If their presence is merely a matter of individual diversity, then the line between Amphiodia and Ophiophragmus becomes very difficult to maintain. If on the other hand, it is an indication of maturity and their absence in the smaller specimens is because the full specific character is not yet assumed, then we have an interesting case of growth-change. That the latter is the correct interpretation is indicated by the appearance of the papillae, some of which are still very small, and by the fact that Müller and Troschel's specimen was only 6 mm. across the disk, the HASSLER specimen is about 7.5 mm., and the specimen from Calbuco is almost 9 mm. Of course, the final determination of the question must await more abundant material. Meanwhile the opinion expressed (1910, Bull. M. C. Z., **52**, p. 341) that *Amphiodia chilensis* is a southern species reaching northward to Peru seems untenable, as all other species of Ophiophragmus are tropical or subtropical in their occurrence.

OPHIOPHRAGMUS LÜTKENI.

Amphipholis lütkeni Ljungman, 1871. Öfv. Kongl. vet.-akad. Förh., **28**, p. 636.

Amphiodia lütkeni Koehler, 1915. Bull. 84 U. S. N. M., p. 69, pl. 6, fig. 1, 2.

Koehler's admirable description and figures make it possible to determine beyond doubt, specimens of this interesting species, which has hitherto been known only from the unique type, taken nearly fifty years ago by Dr. A. Goës at Tortola, Virgin Islands, in 10 fms. I found the species fairly common at Sandy Point, in Buccoo Bay, Tobago, where it occurred buried in soft, sandy mud in two or three feet of water, in company with *O. septus*, *Ophionema intricata*, and species of Amphiodia. My largest specimens are of about the same size as the holotype, the disk measuring 5–6 mm. across and the arms 80–90 mm. in length. This species has the habit common to many amphiurans of shedding the disk autonomously and about one third of the specimens collected are diskless. But this shedding of the disk was undoubtedly caused in part, if not wholly, by the method of collecting, for it was necessary to dig up a shovelful of sand and sift it through a rather coarse sieve in order to find these mud-loving brittle-stars. The washing of the sand through the sieve was necessarily a rough process.

OPHIOPHRAGMUS MARGINATUS.

Amphiura marginata Lütken, 1856. Vid. med., p. 26. 1859. Add. ad hist. Oph., pt. 2, p. 119, pl. 3, fig. 3*a*, *b*.
Ophiophragmus marginatus Lyman, 1865. Illus. cat. M. C. Z., no. 1, p. 132.

This species does not seem to have been met with since it was described from a specimen taken at Punta Arenas, Costa Rica, and I have never seen a specimen. The distinguishing character given above in the key is well-shown in Lütken's figure but whether it is really an important specific character remains to be proven. Probably the species is valid but just how it differs from the West Indian forms can only be known when the type (or new material) is compared with them critically.

OPHIOPHRAGMUS BRACHYACTIS.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 238, pl. 10, fig. 13, 14.

The validity of this species can only be determined by more material. It may be an extreme individual variant of *O. wurdemanii* but only large series of the latter species can demonstrate this. The unique holotype was taken in 47 fms., off Sombrero Key, Florida, April 2, 1872.

OPHIONEPHTHYS.

This is not a large genus, only five species having been assigned to it since its establishment by Lütken nearly fifty years ago. But as Matsumoto has treated it as a synonym of Amphiura, it seems to me desirable to reconsider its status. The rediscovery of Ophionema (p. 282) lends added interest to the matter for few will question the validity of that genus, and the species hitherto called Ophionephthys are obviously intermediate between it and those larger species of

Amphiura which have more or less naked skin on the disk. It is because of the existence of this group of Amphiuras that Matsumoto has abandoned Ophionephthys, and if the naked disk of this genus were its only character, it would indeed be of little value. But the species, which may be assigned to Ophionephthys, agree in a number of characters and make a natural and fairly homogeneous group. Curiously enough the original and hence, of course, type-species is not typical but in at least two characters differs from the others. Moreover it is a West Indian species, while all the others are East Indian (from Japan to Australia). It might indeed be desirable to leave Ophionephthys, a monotypic West Indian genus and give the Japanese and Australian species a new generic designation were it not that the Philippine species is very evidently intermediate and could be almost as well assigned to the West Indian as to the Japanese group. Nevertheless the differences in the oral armature between *O. limicola* and the other members of the genus are serious and if adequate material proves them to be constant, they might well be considered generic. So few specimens of Ophionephthys have as yet been collected however, that it seems best for the present to retain the name for all those amphiurans which agree in the following characters: — Disk (at least in adults) covered with a naked skin, calcareous scales occurring only around the radial shields and rarely near the disk-margin interradially; upper arm-plates small, thin, never very wide nor broadly in contact; arm-spines numerous, 5–10 on basal joints; oral papillae as in Amphiura, a pair of block-like thick papillae at tip of jaw and one conspicuous papilla on each oral or adoral plate (but in *O. limicola* there are usually 2 and sometimes 3 small papillae instead, situated on each oral plate); the papilla guarding the first oral tentacle-pore is usually evident and may be very conspicuous; no tentacle-scale (or a single very small one on most pores, in *O. limicola*) on the very large tentacle-pores.

In addition to the species hitherto assigned to Ophionephthys, I refer two species of Amphiura from Japan, described by Matsumoto. I have no doubt that author would himself have called his species Ophionephthys had he regarded the genus as entitled to recognition. One of the species hitherto described as Ophionephthys was based upon several diskless specimens from Brazil. Bell, believing that the loss of the disk indicated a small amount of calcareous matter therein, called his new species *Ophionephthys*(?) *sesquipedalis*. But, aside from the fact that the nakedness of the disk is a pure assumption, his specimens were clearly not Ophionephthys as here defined for there were only 3 arm-spines, the upper arm-plates were three times as wide as long and broadly in contact, and there was a distinct tentacle-scale. There is little reason to doubt that Bell's specimens are Amphiuras but the species certainly cannot be determined from the data published.

The six species of Ophionephthys which seem to be valid may be distinguished as follows: —

KEY TO THE SPECIES OF OPHIONEPHTHYS.

a Arm-spines on basal arm-segments not more than 5.
  b Upper arm-plates narrow, not twice as wide as long.
    c Oral shields longer than wide; usually 2 or 3 small, distal oral papillae; usually a single small tentacle-scale.................... *limicola*
    c′ Oral shields wider than long; 1 distal oral papilla, or rarely 2; no tentacle-scale.. *phalerata*
  b′ Upper arm-plates twice as wide as long.................... *aestuarii*
a′ Arm-spines on basal arm-segments, 7–10.
  b Upper arm-plates twice as wide as long..................... *vadicola*
  b′ Upper arm-plates much longer than wide.
    c Distal oral papilla more or less cylindrical or terete; arm-spines, 8–10 *ecnomiotata*
    c′ Distal oral papilla, flat and scale-like, though thick; arm-spines, 7 or 8.. *octacantha*

OPHIONEPHTHYS LIMICOLA.

Lütken, 1869. Add. ad hist. Oph., pt. 3, p. 24, 25, fig.

No specimens with disks are accessible but according to Lütken's figure there is a well-marked marginal series of scales across the interradii. This does not occur in any other species of the genus. The number and arrangement of the oral papillae is peculiar, for each oral plate bears two, rarely one or three, very small, blunt papillae and there is no large papilla on the adoral plate or near its junction with the oral plate. The pair of block-like papillae on apex of the jaw is conspicuous. In all three of the cotypes in the M. C. Z. collection, there is nearly always present a minute tentacle-scale either on the side arm-plate or in the angle where this plate joins the under arm-plate. So far as I can ascertain this species had not been met with since its original description, until in June, 1917, two specimens were dredged in shallow water near Loggerhead Key, Tortugas. Unfortunately these specimens are, like all of those in the M. C. Z., diskless, but there is no doubt of their identity.

OPHIONEPHTHYS PHALERATA.

Lyman, 1874. Bull. M. C. Z., **3**, p. 229, pl. 6, fig. 7–9.

This species is much nearer to *O. limicola* than is any other member of the genus. The resemblance is particularly noticeable aborally for the upper arm-plates are distinctly wider than long in both species and are not unlike in shape and size. Orally the differences are more striking but the distal oral papilla of *O. phalerata* is quite small, and more like those of *O. limicola* than are those of other members of the genus; it is, however, always single apparently. The unique was from the Philippines and I find no records since its original description.

OPHIONEPHTHYS AESTUARII.

Amphiura aestuarii Matsumoto, 1915. Proc. Acad. nat. sci. Phila., **67**, p. 73.

From a careful comparison of the holotype of *O. phalerata* with Matsumoto's description of this species, I am strongly inclined to believe they are identical, but an actual comparison of specimens is desirable to determine the point. The only tangible difference noted is in the width of the upper arm-plates and this is probably not constant. The peculiarity of the next to the lowest arm-spine referred to by Matsumoto is marked in the holotype of *O. phalerata.* Matsumoto's specimens were from Misaki, Japan.

OPHIONEPHTHYS VADICOLA.

Amphiura vadicola Matsumoto, 1915. Proc. Acad. nat. sci. Philad., **67**, p. 71.

Matsumoto considers this species near *O. phalerata* but the number of arm-spines is a very reliable distinction. Other differences would probably be obvious on direct comparison of specimens. Matsumoto's types were from Sakurajima, Kagoshima Gulf, Japan, where the species occurs in abundance. Its interesting habits were described by Professors Mitsukuri and Hara, (1897. Annot. zool. Jap., **1**, p. 68).

OPHIONEPHTHYS ECNOMIOTATA.

Amphiura ecnomiotata H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 148, fig. 59.
Ophionephthys ecnomiotata H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 239.

The upper arm-plates of this and the following species are strikingly different from those of the other members of the genus; their extreme narrowness is probably associated with the large number of arm-spines. A small specimen collected by Prof. E. S. Morse in Tokyo Bay, Japan, differs from the adult holotype in a few details. The maximum number of arm-spines appears to be 8 which might be expected from the small size of the specimen. The disk is little more than 2 mm. across, in its present dried condition, and numerous minute scales are present at the center. This is interesting as indicating that very young specimens may have the disk entirely covered with scales, thus showing that Ophionephthys passes through an Amphiura stage. The present species is known only from the eastern coast of southern Japan.

OPHIONEPHTHYS OCTACANTHA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 239, pl. 9, fig. 9, 10.

This species is known only from a single specimen taken at Friday Island, in Torres Strait. It resembles the preceding in many important points but the marked difference in the form of the distal oral papilla is a good distinguishing character.

OPHIONEMA INTRICATA.

Plate **2**, fig. 1–3.

Lütken, 1869. Add. ad hist. Oph., pt. 3, p. 27 (fig.), 94, 98.

The rediscovery of this remarkably interesting brittle-star, the only species of the genus, and hitherto known from only a single specimen, was one of the noteworthy results of collecting at Tobago. We found it quite common in the sandy mud in two or three feet of water at Sandy Point, Buccoo Bay, where it occurred with half a dozen species of Ophiocnida, Amphipholis, Ophiophragmus, and Amphiodia. Generally the disks were shed in the process of collecting (by sifting the mud through a sieve) but a few perfect specimens were secured. These uninjured specimens were very active when placed in a basin of clean water, moving around the dish repeatedly and rapidly. Their method of progression was very striking and is worthy of note; one of the arms was thrust straight ahead its full length, the tip was sharply bent back, forming a hook, the arm was then contracted into a wide S, and thus the disk was drawn up near the hook, with the other four arms trailing inertly behind. The process being rapidly repeated led to a speed not often attained by an echinoderm. The excessive length of the arms, fully twenty times the diameter of the disk, gives the animal an extraordinary appearance when in motion.

As no detailed description of this remarkable brittle-star has ever been published, the following data will be of use. The disk is soft, puffed, about 6–8 mm. in diameter, black, with the radial shields, genital plates and genital scales white in marked contrast, as in Lütken's figure. The arms are 140–150 mm. in length, more or less. The upper arm-plates are broadly oval, about as long as wide, widest *proximal* to middle, more or less fully in contact; they are thin and their outlines are difficult to make out even in a dry specimen. The whole upper surface of the arm is finely punctate. The color of this upper surface is pale yellowish or nearly white, but on each side is a broad, irregular and frequently interrupted longitudinal band of deep purple. Orally the color is yellowish white but except on the basal sixth or fifth of the arm, there are frequent splashes of faint purple, covering two–four under arm-plates more or less imperfectly; although these splashes are most irregular in their arrangement they give a banded appearance to the under side of the arms. The under arm-plates are distinctly longer than wide, proximally rounded, distally notched, fully in contact. There are no tentacle-scales, but the tentacle-pores are large. Basally there are five arm-spines, slender, acute, rather delicate; the first (*lowest*) is longest and exceeds the segment; the next two are much smaller and about of a size; the fourth and fifth are nearly or quite equal to the first. After about 30–40 joints, there are only four spines, and these are subequal and exceed the segment. The madreporite is very large, rounded pentangular, much wider than long; the other oral shields are much smaller and have a rounded distal lobe; they might be described as broadly triangular with all angles much rounded, the base of the triangle proximal and the lateral sides sharply and rather deeply concave. The adoral plates are small, somewhat triangular with rounded angles and concave sides; they are separated radially by the first under arm-plate and interradially by a large depression or pore, which occupies the surface of the jaw, much as in Ophiothrix. The oral plates are small but distinct and well-developed. There are two oral papillae on each side, as in Amphiura, a big block-like one proximally and a very small flat, bluntly pointed one distally where the oral and adoral plates meet.

AMPHIPHOLIS PACHYBACTRA, sp. nov.

παχύς = thick + *βάκτρον* = club, in reference to the very thick middle arm-spine.

Plate **1**, fig. 3–5.

Holotype.— M. C. Z. 4,140, and 6 *Paratypes*, M. C. Z. 4,141. British West Indies: Tobago, Buccoo Bay, Sandy Point, April, 1916, in sandy mud in 2–3 ft. of water, in company with Ophionema, Ophiophragmus, Ophiocnida, and other amphiurids. Carnegie Expedition. H. L. Clark coll.

Disk, 6 mm. in diameter; arms 65 mm. long. Disk slightly puffed, especially in the interradial areas, covered with a coat of rather thick but very small scales, about a dozen series in each interradial area where narrowest; no primary plates distinguishable. Radial shields small and closely joined, except at inner end; they are not one millimeter long, and the width of each is evidently less than half its length. Upper arm-plates fully twice as wide as long, barely in contact; basally they are very broadly triangular with a proximal angle and truncate, rounded lateral angles but they become more and more ellipsoidal by the rounding of the angles. Interbrachial areas below covered by a coat of fine scales, noticeably smaller than those on the upper surface of disk. Oral shields, spearhead-shaped, widest distal to middle, proximal angle acute, distal angle rounded, almost as wide as long. Adoral plates moderately large, wider without than within where they meet fully; radially they are separated by first under arm-plate. Oral plates small and difficult to make out. Oral papillae, 3 on a side, of which the distal is .25–.30 mm. wide, as wide as the other two together; the latter are subequal and lie side by side, the proximal not standing close to its fellow on the tip of the jaw. Under arm-plates pentagonal; with a sharp proximal angle, and the distal, lateral angles slightly rounded; they are as wide as long or wider and are barely in contact. Side arm-plates rather large, scarcely meeting, however, either above or below until beyond the middle of arm; each carries 3 (at base of arm, 4) spines, a little longer than the segment; the lowest is stout at base but tapers somewhat abruptly to a blunt point; the next (second) is much stouter and has a very blunt, almost truncate, more or less prickly tip; the third is much more slender and quite acute; the fourth, when present, is similar to the third but is much smaller. Tentacle-scales 2, large and flat, one on the side arm-plate and the other on the under arm-plate, as usual. Color, in life, pale yellowish with a distinctly greenish tinge, especially on the disk; in the dry specimen the colors are little changed.

The paratypes (except one very small one) differ markedly from the holotype in color. They are more or less dusky with or without a distinct green tinge, and the arms are variegated to a greater or less degree with dusky and whitish. In four of the paratypes, the primary plates of the disk are very well-marked, so that the upper surface has quite a different appearance from that of the type. The radial shields are also much longer and narrower, being fully 3–4 times as long as wide. These peculiarities may be due to the disks having been recently regenerated, and this view is strengthened by the fact that the oral surface and the arms are essentially alike in all the specimens. There is more or less individual diversity in the size and shape of the distal oral papilla, and in some specimens it is scarcely as wide as the proximal two. Such specimens approach Amphiodia and it is natural to consider this species as near the border-line between the two genera. It seems to be nearest, however, to *Amphipholis geminata* and *A. gracillima*, from which species it may be distinguished by the arm-plates and spines.

OPHIOSTIGMA RUGOSUM, sp. nov.

rugosus = rough, in reference to the upper surface of the disk.

Plate 3, fig. 6.

Holotype.— M. C. Z. 3,965. Philippine Islands: Mindoro, Port Galera. June, 1912. L. E. Griffin coll.

Disk, 5 mm. in diameter; arms about 30 mm. long. Disk covered by an uneven, thick skin in which no scales can be detected; there is evidently calcareous matter in or beneath the skin which serves as support for numerous, unequal blunt tubercles or papillae, 1–3 times as high as thick, arranged without any apparent order. Radial shields visible as areas free from these tubercles but their outlines are concealed by the thick skin; they seem to be about twice as long as wide and in contact except proximally. Upper arm-plates rounded triangular, considerably swollen, widest near distal margin, very slightly in contact or (more exactly) overlapping. Interbrachial areas below similar to disk but the tubercles are very much smaller. Oral shields rather small, about as wide as long, with a very acute angle and strongly concave sides proximally and a rounded distal angle. Adoral plates relatively very large, not twice as long as wide, nearly as wide within where they meet broadly as without where they are separated by the first under arm-plate. Oral plates small but distinct, not much longer than wide. Oral papillae, 3 on a side; distal papilla, three times as wide as long, much wider than the other two papillae together; second papilla flat, about as wide as long; proximal papilla thick and block-like, but not placed at apex of jaw. On one jaw, the distal papilla appears to be fused with the middle papilla; at any rate it is that much wider than usual, and there is no middle papilla. In another case, the distal papilla appears to have divided as it is only a little more than half as wide as usual and there are *two* middle papillae. First under arm-plate very small, perfectly pentagonal; succeeding plates large, squarish or rounded hexagonal, as wide as long, broadly in contact, but soon becoming separated and then longer than wide; distal margin convex but lateral margins tend to become more or less concave. Side arm-plates rather projecting, meeting above and below except at base of arm; each carries 3 small, subequal, blunt arm-spines about equal to a segment. Tentacle-scales 2, one on the side arm-plate and one on the under arm-plate; but located far out on those plates instead of at their junction; hence they seem to be distal to the tentacle, a most anomalous condition, but apparently not widely different from that shown by the other members of the genus. Color, dried specimen, disk, variegated with blackish, gray, and whitish; arms, pale yellowish.

The disk-covering of this species distinguishes it at once from the other members of the genus except possibly *A. formosa* and from that species, the oral papillae separate it at once. Orally the resemblance to *A. africanum* is quite close but the disk-covering is utterly different.

AMPHIODIA MESOPOMA.

Plate 3, fig. 7.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 247, pl. 6, fig. 11–14.

Among the brittle-stars collected in 1915, at Westernport, Victoria, by Mr. J. Gabriel are a number of specimens which I believe represent this species. At any rate I cannot find any tangible character by which they may be distinguished. It is certainly extraordinary that a species the unique holotype of which was collected in Torres Strait, should be found at Westernport but comparison of the specimens has satisfied me that such is the case. This comparison has moreover revealed an unfortunate mistake in the original description. The broken arms which were supposed to be the arms of *A. mesopoma*, and figured as such (pl. 6, fig. 12, 14), now prove to belong to some other amphiuran (probably *Amphioplus parviclypeus*). The holotype of *A. mesopoma* broke off all of its arms autotomously soon after it was collected and as specimens of *A. parviclypeus* were in the same pail, it is not difficult to see how the confusion occurred. The specimens from Westernport are smaller than the Torres Strait specimen, but not very much so, and have some of the arms nearly intact. They show that the upper arm-plates in *A. mesopoma* are only about twice as wide as long, are considerably narrower proximally than distally and do not have the distal corners noticeably rounded. In view of these differences the true shape of the upper arm-plates in *A. mesopoma* is shown (Plate **3**, fig. 7).

AMPHIODIA PLANISPINA.

Amphiura planispina von Martens, 1867. Monatsb. K. Preuss. akad. wiss. Berlin, p. 347.
Amphiodia planispina Verrill, 1899. Trans. Conn. acad., **10**, p. 313.

After considerable hesitation, I refer to this Brazilian species, a very fine Amphiodia dug out of the mud and eel-grass roots on the southeast side of Loggerhead Key, Dry Tortugas, June 21, 1917. The disk is nearly 10 mm. across and the arms are about 70 mm. long. So far as the oral surface and the arms are concerned the specimen is readily referred to *A. planispina*, but the arm-spines are less flattened, the disk-scaling is less coarse and the radial shields are less nearly circular than in the cotypes of that species from Brazil. But none of these differences is anything more than of degree, and it is unlikely that they have any real taxonomic significance. In a typical *A. planispina*, each radial shield is 1.4 mm. long by 1 mm. wide, while in the Tortugas specimen, each shield is 1.8 mm. long by 1 mm. wide. In typical *A. planispina* there are only 10–15 disk-scales to a square mm. while in the Tortugas specimen there are 20–25. In life, the Tortugas specimen had the disk gray with a yellowish tinge and the arms yellowish white; a few irregularly scattered upper arm-plates are partially dusky purplish, but there is not nearly so much dark coloring as in typical *A. planispina*.

AMPHIODIA RHABDOTA, sp. nov.

ῥαβδωτός = striped, in reference to the longitudinal line on the arms.

Plate 8, fig. 4.

Holotype.— M. C. Z. 4,216. Florida: Dry Tortugas, Bush Key reef-flat, June 18, 1917, in mud and eel-grass roots, in 2–3 ft. of water. Carnegie Expedition. H. L. Clark coll.

Disk 6 mm. in diameter; arms 40–45 mm. long. Very similar to *A. planispina* but the disk-scaling is much finer, the radial shields are long and the upper arm-plates are different. Orally, the two species are identical save in coloration. In *A. rhabdota*, there are about 50 disk-scales to each square mm. The radial shields are nearly three times as long as wide (1.7 × .6 mm.) and their proximal ends are a little separated. The upper arm-plates are broadly oval, rounded and not squarish on the lateral margins, and are only twice as wide as long. In coloration, the disk is gray and the arms yellowish white as in *A. planispina*, but the irregular dusky markings on the arm are yellowish and very faint, while there is a distinct, narrow, dusky longitudinal stripe on the upper arm-surface; this line is occasionally broken or interrupted. Nearly all the under arm-plates have a median longitudinal dash of brownish red and these dashes tend to form an intermittent narrow stripe.

It does not seem possible to consider this specimen an immature example of *A. planispina*, for the changes of growth do not *decrease* disk-scales, and no case is known of radial shields becoming so much shorter and wider with age. Of course there is a possibility that a large series of Amphiodias from the West Indian region, will show *A.*

planispina a sufficiently variable species to include *A. rhabdota* as well as the larger Tortugas specimen here referred to it. But until such material is available, it seems better to distinguish the two forms.

AMPHIODIA TRYCHNA, sp. nov.

τρύχνος = rough, in reference to the character of the disk.

Plate **3**, fig. 1–3.

Holotype.— M. C. Z. 4,144. British West Indies: Tobago, Buccoo Bay, Sandy Point, April, 1916, in sandy mud in 2–3 ft. of water, in company with half a dozen other species of amphiurans. Carnegie Expedition. H. L. Clark coll.

Disk, 3.5 mm. in diameter; arms 30–35 mm. long. Disk covered with a coat of coarse, thick scales; only about 5 series in each interradial area; these scales are swollen on the distal margin and on the larger ones are additional knobs; the whole surface of the disk is thus quite rough and irregular. Radial shields, relatively large, about equal to half disk-radius and twice as long as wide, closely joined along their straight adradial edges; except along the abradial margins they are sculptured and rough. Upper arm-plates fan-shaped or triangular but, except at very tip of arm, sufficiently overlapped so that the proximal angle is considerably truncate; they are wider than long, the distal margin is slightly convex and the distal angles are rounded. Interbrachial areas below covered with coarse scales, swollen on the distal margin. Oral shields, diamond-shape, longer than wide (except madreporite), rough and slightly swollen. Adoral plates, very large, swollen, not much longer than their distal width, narrower within where they are broadly in contact; radially they are widely separated by first under arm-plate. Oral plates small, but evidently swollen proximally. Oral papillae 3 on each side, thick, slightly swollen at tip; distal one widest, fan-shaped, not so wide as the other two together. First under arm-plate rather large, triangular, distal margin conspicuously swollen; succeeding four or five pentagonal, with proximal angle more or less truncate, as wide as long or wider, more or less conspicuously swollen distally; succeeding plates squarish, as long as wide or longer, broadly in contact, not swollen. Side arm-plates, rather small, not meeting either above or below; each bears 3 subequal, truncate, flattened spines, as long as the segment. Tentacle-scales, 2, large and conspicuous. Color, in life.

disk pale gray; under surface, side arm-plates and spines, whitish; upper arm-plates irregularly white, dusky or deep gray, so the arms look unevenly banded; every upper arm-plate regardless of its ground-color has the distal margin white and is crossed, immediately behind this white margin by a very distinct band of deep gray; on plates which are themselves deep gray, this band is almost black. The color of the preserved specimen shows little change.

The unusual character of this specimen was recognized when it was collected, but diligent search failed to reveal another. It is quite unlike any other West Indian brittle-star both in character of disk-plates and in coloration. The distal oral papilla is so wide that it would not be unnatural to include the species in Amphipholis but as it does not quite equal the other two together, and as it is quite fan-shaped in form, it is better to regard *trychna* as an Amphiodia.

AMPHIODIA TYMBARA, sp. nov.

τύμβαρος = buried, in reference to the manner of life.

Plate 2, fig. 6.

Holotype.— M. C. Z. 4,145. British West Indies: Tobago, Buccoo Bay, Sandy Point, April, 1916, in sandy mud, in 2–3 ft. of water, with half a dozen other species of amphiurans. Carnegie Expedition. H. L. Clark coll.

Disk, 8 mm. in diameter; arms at least 150 mm. long; the disk has probably been recently regenerated and would perhaps ultimately be a little larger but it is clear that the arms are fully 15 times the diameter of the disk; two of the arms are regenerating from near the base, one from the ninth the other from the twenty-fourth segment, and they are not only shorter but much more slender than the normal arms. Disk covered by a close coat of fine overlapping scales, about 15 series in each interradial area; no primary plates can be distinguished. Radial shields short, wide, and closely joined; length about one third of disk-radius; width about two thirds of length. Upper arm-plates exceedingly wide and short, in contact for their full width; length about one fourth of breadth. Interbrachial areas below covered with rather coarse, overlapping scales. Oral shields (except madreporite, which has length and breadth about equal) much longer than wide, sharply pointed within; distal end blunt and distal sides quite concave. Adoral plates rather large, a little swollen, much wider without, where separated by first under arm-plate, than within, where they meet. Oral plates, small but distinct. Oral papillae, 3 on each side, quite thick, the most proximal, at the tip of the jaw, block-like; distal papilla much the largest, somewhat fan-shaped. First under arm-plate moderate, rectangular, much wider than long; succeeding plates similar but much larger, distal margin slightly concave, corners rounded, in contact for full width; distal portion of basal plates distinctly swollen. Side arm-plates very small, each bearing 3 subequal, blunt, little flattened arm-spines, distinctly longer than the arm-segment. Tentacle-scales 2, moderately large. Tentacle-pores very large. Color, in life and as preserved, variegated gray and white above, nearly white below; the upper arm-plates show much diversity and no sort of sequence in ground-color, but the distal margin is generally white and often back of that is an indistinct dusky transverse band.

This species resembles *Ophiophragmus wurdemanii* so much in its superficial appearance that it was supposed to be that species, when taken. But there is no hint whatever of marginal papillae and the differences in disk-scaling and arm-spines cannot be ignored. It is also very near *Amphiodia atra*, *A. riisei*, and *A. planispina* but the smaller radial shields and tentacle-scales and the smaller and sharper arm-spines distinguish it from *A. atra*, the very much longer arms separate it from *A. riisei* at a glance, and the finer disk-scaling and slenderer arm-spines show it is not *A. planispina*.

AMPHIOPLUS CONIORTODES, sp. nov.

κονιορτώδης = powdery, like dust, in reference to the very fine disk-scaling.

Plate **7**, fig. 3, 4.

Holotype.— M. C. Z. 4,217. Florida: Key West, June 1917, in sandy mud near a mangrove key, in 1–2 ft. of water, with *Amphioplus abditus* and *A. thrombodes* (p. 292). Carnegie Expedition. H. L. Clark coll.

Disk distorted, but doubtless 6–7 mm. in diameter; arms 75–85 mm. long. Disk covered by a coat of exceedingly fine scales; those along the interradial margins are conspicuously larger, the largest being next to the distal end of the radial shields. The latter are quite small, about three times as long as wide, with the pointed proximal ends separated by a few scales and the wide distal ends in contact. Upper arm-plates, much wider than long, hexagonal with slightly rounded corners, more or less broadly in contact. Interbrachial areas below, completely and abruptly naked; the contrast with the coarser, marginal scales of the disk being very marked. Oral shields large, rounded, triangular, fully as wide as long. Adoral plates very narrow, scarcely or not meeting within. Oral plates relatively large and a little swollen. Oral papillae four or only three on each side, and in addition the first oral tentacle-scale, which is very conspicuous, is pushed down almost in line with the oral papillae between the thick, block-like proximal one and the more scale-like ones which follow; the two distalmost are borne on the adoral plate but the outer one is very small and is often imperfect or wanting. First under arm-plate very small, squarish, thick; succeeding plates, longer than wide, with distal notch and proximal, rounded angle. Side arm-plates small, each with three sharp, slender spines, of which the middle one is slightly the largest and about equals the arm-segment in length. Tentacle-scales two, very small, particularly the one on the under arm-plate. Color, in life and as preserved, disk very pale gray or silvery; arms white with a brown tinge near base; many upper arm-plates more or less dusky purple of a light shade, nearly always with a white spot at center; these darker plates are very irregularly scattered, sometimes occurring singly but more often several (3–5) together; arm-spines, and oral surface of body and arms nearly white.

This species is undoubtedly near to both *A. abditus* and *A. tumidus* but is readily distinguished from them by the much finer disk-scaling, the perfectly naked interbrachial areas ventrally, the big, wide oral shields and the slender, sharp arm-spines. In *A. tumidus*, the entire mouth-frames are heavier than in *A. coniortodes* and the adoral plates in particular are bigger and thicker.

AMPHIOPLUS THROMBODES, sp. nov.

θρομβώδης = lumpy, in reference to the condition of the disk-scales.

Plate 7, fig. 1, 2.

Holotype.— M. C. Z. 4,218 and a *Paratype*, M. C. Z. 4,219. Florida: Key West, June, 1917, in sandy mud near a mangrove key in 1–2 ft. of water, with two other species of Amphioplus. Carnegie Expedition. H. L. Clark coll.

Disk 5 mm. in diameter; arms about 60 mm. long. Disk covered by a coat of rather fine scales, which are, however, much coarser around the radial shields; near the center of the disk there are 75–80 scales per square mm.; all (or nearly all) the disk-scales have the distal margin swollen into a conspicuous papilla or lump, the height of which may equal the diameter of the scale. Radial shields long and narrow, the length sometimes equalling four times the width of the distal end; they are separated proximally by several scales and are only in contact for the distal third. Upper arm-plates broadly oval or rounded hexagonal, nearly twice as wide as long, only in contact in the median line. Interbrachial areas below very sparsely covered with minute, more or less papilliform scales. Oral shields almost twice as long as wide, rounded pentagonal, equally wide distally and proximally; madreporite much larger than the others and nearly as wide as long. Adoral plates rather small, irregularly triangular with concave sides and rounded angles; they meet interradially and their distal corners tend to separate the oral shield from the first side arm-plate. Oral plates rather large, the proximal end distinctly swollen. Oral papillae, four on each side; the first (most proximal) is thick and block-like and is more or less distinctly separated from its fellow (on the other side of the jaw) by the lowest tooth; the second is small and papilliform while the third is much wider and flatter; these first three papillae are all borne on the oral plate and are well-spaced from each other; the fourth papilla, which is about equal to the second but is a little flatter and more circular, is borne on the outer proximal angle of the *first under arm-plate,* and is well-spaced from the third. First under arm-plate rather large, somewhat pentagonal with rounded corners, wider than long; succeeding plates about as long as wide, pentagonal with rounded corners, the distal margin more or less concave, barely in contact with each other. Side arm-plates moderate, each with three subequal, slender, pointed arm-spines about as long as the segment. Tentacle-scale single, small, rounded, borne on the side of the under arm-plate. Color, in life and preserved, disk pale gray; arm-spines white; arms white or brownish white; many upper arm-plates obscurely blotched or shaded with light dusky purple.

The paratype has the disk 4 mm. across and the arms are scarcely 40 mm. long. The primary plates (11) of the disk are very distinct and are perfectly flat. The interbrachial areas below are uniformly covered with small lumpy scales. The oral shields are not much longer than wide. In all other particulars, the smaller specimen agrees remarkably well with the larger, but there is very little of the dusky purplish coloring on the upper arm-plates and that only near the tip of the arm.

This species is well-characterized by the disk-covering, the single tentacle-scale, and the oral papillae. In the first character it resembles the Japanese *Amphiura trachydisca* but in no other particular is it like that species. It is certainly a noteworthy fact that this species was dug from among "eel-grass" (or "turtle-grass") roots on a bottom of firm sandy mud close to mangroves, in company with *Amphioplus abditus* and *A. coniortodes.* No other brittle-stars were found there and of these three species, only *A. abditus* was found at the Tortugas during the following weeks.

OPHIACTIS.

This is one of the large genera of brittle-stars to which species have been added year after year without any adequate comparison of the different forms with each other. The genus was established by Lütken in 1856, who included at the time only two species, *O. krebsii* and *O. mülleri,* though he added four others a month later. He also suggested that *O. ballii* might be properly placed in the genus. Lütken's diagnosis of the genus is brief but sufficiently explicit, while the general facies of the species is usually quite characteristic. Indeed too much reliance has been placed on the general facies and as a result a number of species have been referred to the genus erroneously. Lütken and Mortensen, (1899. Mem. M. C. Z., **23**, p. 143) called attention to the fact that certain amphiurans, lacking a pair of subdental oral papillae, had been wrongly placed in Amphiura, and on the strength of this one character transferred them to Ophiactis. Recent writers have followed this arrangement but Matsumoto, (1915. Proc. Acad. nat. sci. Phila., **67**, p. 67) called attention to the fact that Ophiactis had thus become a very unnatural group, and he removed several species to a new genus Amphiactis, which he placed in a separate family. When the Catalogue of Recent Ophiurans (1915. Mem. M. C. Z., **25**) was published I was not convinced of the necessity of this action but after critical study I am satisfied Matsumoto is right.

As restricted Ophiactis includes those amphiurids with genital slits, no paired subdental papillae, 1 or 2 oral papillae on each side of the jaw (in rare individual cases, 3 may be present on some of the jaws) and a single large tentacle-scale. The last, although not mentioned by Lütken, is one of the most constant and noticeable characters. It is possible that two tentacle-scales may sometimes occur on the first pair of pores but I have seen no such case. Ophiopus is very near Ophiactis but is distinguished by the absence of genital slits. Amphiura (and most other genera in the family) are readily separated by the pair of subdental papillae, while Amphiactis has 3–5 oral papillae on each side of the jaw, and 2 tentacle-scales.

More than seventy specific names have been used in connection with Ophiactis but 15 represent species which should be referred to other genera. These are as follows: —

Ophiactis canescens Lütken and Mortensen, 1899,	is an	Amphiactis
clavigera Ljungman, 1864,	" "	Ophiolebes
dissidens Koehler, 1904,	" "	Amphiactis
duplicata Lütken and Mortensen, 1899,	" "	Amphiactis
humilis Lyman, 1869,	" "	Ophiolebes
lorioli Koehler, 1897,	" "	Amphioplus
minor Döderlein, 1910,	" "	Amphipholis
nigrescens Hutton, 1872, is probably	an	Ophiocoma
parata Koehler, 1904,	is an	Amphiactis
partita Koehler, 1897,	" "	Amphiactis
patula Lyman, 1879,	" "	Amphiactis
pectoralis Lyman, 1880,	" "	Amphiactis
picteti de Loriol, 1893, is probably an		Amphiactis
purpurea Meissner, 1901,	is an	Ophiothrix
umbonata H. L. Clark, 1915,	" "	Amphiactis

Three of the species in this list demand a little further consideration: — *O. nigrescens* Hutton has never had any adequate description as no zoölogist seems to have met with it in the past forty-five years; *O. pectoralis* was well described by Lyman but has not been studied since the Challenger Report was published, and actual comparison of it with species of Amphiactis is very desirable; *O. picteti* was considered by de Loriol, to be an Ophiocnida, from which genus the present writer placed it in Ophiactis, but as it has two tentacle-scales on the basal pores of the arm, it is debarred from that genus as here defined; Koehler has seen specimens and regarded them as Ophiocnida but the mouth-parts exclude them from that group, as they do indeed from Amphiactis; it is very possibly a new generic type.

Of the remaining 56 specific names associated at one time or another with Ophiactis, 21 are synonyms pure and simple of valid species.

The following list gives these names with the name of which each is a synonym: —

atacamensis (Philippi) = kröyeri Lütken
brachygenys H. L. Clark = plana Lyman
brocki de Loriol = savignyi Müller and Troschel
corallicola Koehler = abyssicola (Sars)
cuspidata Lyman = abyssicola (Sars)
dispar Verrill = mülleri Lütken
echinata Koehler = abyssicola (Sars)
flexuosa Lyman = plana Lyman
fragilis Ljungman = kröyeri Lütken
incisa von Martens = savignyi (Müller and Troschel)
krebsii Lütken = savignyi (Müller and Troschel)
ljungmani Marktanner-Turneretscher = mülleri Lütken
longibrachia H. L. Clark = mülleri Lütken
magellanica Ljungman = asperula (Philippi)
örstedii Lütken = simplex (Leconte)
perplexa Koehler = plana Lyman
poa Lyman = abyssicola (Sars)
profundi Lütken and Mortensen = plana Lyman
reinhardtii Lütken = savignyi (Müller and Troschel)
sexradia (Grube) = savignyi (Müller and Troschel)
virescens Lütken = savignyi (Müller and Troschel)

To the remaining 35 species of Ophiactis I have been obliged to add one, of which numerous examples were collected in Buccoo Bay, Tobago. These 36 species, which appear to be valid, form a rather homogeneous group within which specific lines are not often very clearly drawn. Adult specimens, as a rule, have well-marked characters, but young individuals are frequently very perplexing, and young specimens are much more generally collected than adults. The genus falls rather naturally into two sections according to either one of two characters, the shape of the upper arm-plates and the number of oral papillae on each side of the jaw. The upper arm-plates are either more or less fan-shaped or they are transversely ellipsoidal or tetragonal; in the former case, they are little or not at all in contact, in the latter, the line of contact nearly or quite equals the width of the arm. But the upper arm-plates in *all* very young specimens are triangular, becoming fan-shaped, and this condition is of course present at the tip of the arm in all members of the genus. When, therefore, reference is made in the following key, to the shape of the upper arm-plates, it should be understood that the plates on the basal third of the arm of adult specimens is meant. With young or small specimens care is necessary to avoid referring it to the wrong section of the genus, but comparison with other specimens will usually prevent mistakes. Errors are also liable to occur with reference to the oral papillae. Species normally with two on each side of a jaw, sometimes show only one or may even show three. But almost invariably these variations occur only on one or two of the jaws, so that the actual species-character is usually easily determined. In *O. savignyi,* however, there is extraordinary diversity, individuals with no papillae occurring in the same locality with those having 1, 2, or 3. But if 3 are present, the most proximal is very small and of little importance. Specimens with no oral papillae are often of fully adult size and the papillae seem to have been lost with age. Species with only one oral papilla on a side are seldom variable but occasionally two papillae occur on one or two of the jaws. The exact form of the oral shields and of the adoral plates is apt to be quite variable but the general form often furnishes a good specific character.

The number of arms is unreliable as many of the species, if not all, reproduce when young, by division. As a result individuals with from 2 to 7 arms may be found, but 5 seems to be the usual number in a typical adult. Of course the number of jaws, oral shields, and pairs of radial shields corresponds to that of the arms. The length of the arms in proportion to the diameter of the disk may furnish a good specific character, but one must be careful that the disk measured is normal and has not recently divided. The number of arm-spines is commonly 3 on the distal half of the arm but is occasionally 4 or rarely 5. Basally the number usually rises to 4, often to 5, not rarely to 6 and occasionally to 7 or even 8. Only in a very few instances do the arm-spines furnish a good specific character. As already stated the upper arm-plates furnish such characters but in those species where they are very broadly ellipsoidal and fully in contact, the character of their distal margins is quite variable. The under arm-plates may also furnish good characters but as a rule they vary a good deal with age, and too much reliance must not be placed on them.

The character of the scaling of the disk may furnish a good specific mark but it is always coarser in young than adult. In some species the underside of the disk lacks scales (in the adult) and even the back may be quite soft and leathery in certain cases. As a rule spinules are present, at least along the margin of the disk, and they may be very abundant all over the disk, but as there is much individual diversity and some changes with age, this is not a character of much taxonomic value. Color is seldom distinctive but occasionally some color-marking is very characteristic. Bearing these tendencies to diversity in mind, the various species may be distinguished as follows: —

KEY TO THE SPECIES OF OPHIACTIS.

- *a* Upper arm-plates more or less fan-shaped, oval or triangular, the proximal angle being truncate to a greater or less degree, when the plates are in contact with each other.
  - *b* Disk covered by rather coarse, flat, rounded scales between which or on their corners or edges are low, conical tubercles; these increase in length near disk-margin becoming short, sharp spinelets; arms short, about 4 × disk-diameter; oral shields pentagonal widest proximally. . .*symbiota*
  - *b′* Disk with or without spines but not as above.
    - *c* 1 oral papilla on each side of each jaw.
      - *d* Oral shields distinctly wider than long; disk-spines few or none; arm-spines 3 or 4.
        - *e* Adoral plates meet more or less fully interradially. . . . .*plana*
        - *e′* Adoral plates do not meet interradially.
          - *f* Interbrachial areas below without distinct scales. .*macrolepidota*
          - *f′* Interbrachial areas below covered by large scales. .*luteomaculata*
      - *d′* Oral shields not distinctly wider than long, somewhat pentagonal, oval or circular.
        - *e* Adoral plates meet interradially.
          - *f* Arms 6, very short, about 2 × disk-diameter; arm-spines 4 or 5. . . . .*brachyura*
          - *f′* Arms longer, 4–8 × disk-diameter.
            - *g* Arms 5; radial shields short, nearly as wide as long; disk-spines numerous. . . . .*nama*
            - *g′* Arms 6; radial shields nearly or quite twice as long as wide; disk-spines none or few.
              - *h* Jaws short, their length scarcely twice width of big oral papilla; adoral plates meeting broadly interradially; oral shield widest proximally. . . . .*pteropoma*
              - *h′* Jaws long, narrow; length more than twice width of slender oral papilla; adoral plates tend to be somewhat parted interradially; oral shield widest distally. .*delicata*
        - *e′* Adoral plates do not meet interradially.
          - *f* Arms 5; disk-spines small but numerous, at least in interbrachial spaces; arm-spines unspotted. . . . .*ballii*
          - *f′* Arms 6; disk-spines few or none.

g Radial shields moderate or small; arm-spines each with a dusky spot on dorsal side.............................*lymani*

g′ Radial shields long and narrow; arm-spines unspotted *dyscrita*

c′ 2 (exceptionally 3) oral papillae on each side of each jaw.

d Upper arm-plates broadly triangular, wider than long.

e Disk-scaling coarse; in each interradial area are about 5 series, the middle one made up of the largest scales but the lateral ones rather coarse; radial shields usually twice as long as broad *abyssicola*

e′ Disk-scaling finer with about 7 series in each interbrachial area; radial shields $\frac{2}{3}$–$\frac{4}{5}$ as broad as long....................*canotia*

d′ Upper arm-plates oval, as long as wide, or longer, basally in contact but distally quite separated from each other.............*loricata*

a′ Upper arm-plates transversely ellipsoidal, or less commonly tetragonal; width 1.3–4 × length; broadly in contact with each other throughout.

b Disk covered in the young with rather coarse scaling both above and below, but after it is 3–4 mm. in diameter the scales tend to be obscured by skin, except around radial shields, and the interbrachial areas below become more or less naked; spinelets usually present on disk and especially in interradii on margins and below; typically 2 oral papillae on each side of each jaw but occasionally only 1 is present and some individuals have none; upper arm-plates swollen; a small dark spot on each side of each arm-segment, either on distal margin of upper arm-plate or between each pair of plates; this spot is often accompanied by a notch in distal margin of upper arm-plate so these plates may have a slightly trilobed appearance; arm-spines 5 or 6 (or more basally); color usually variegated green and white; cosmopolitan..................*savignyi*

b′ Not as above.

c 1 oral papilla on each side of each jaw.

d Radial shields moderate or large, their length equal to half radius of disk, more or less.

e Adoral plates nearly or fully meeting interradially.

f Oral shields much wider than long; arms 5; arm-spines 5 or 6. *kröyeri*

f′ Oral shields not much wider than long; arms 5 or 6; arm-spines 4 or 5.................................*simplex*

e′ Adorals completely separated interradially by oral shield.

f Disk-scales rather coarse, about 5 series in each interbrachial area; oral shields pentagonal or rounded triangular, not longer than wide.

g Arms 5–7 × disk-diameter; upper arm-plates 3–4 × as wide as long......................................*modesta*

g′ Arms 3–4 × disk-diameter; upper arm-plates not quite 2 × as wide as long.

h Oral papillae narrow and elongated; under arm-plates transversely ellipsoidal; no blue................*affinis*

h′ Oral papillae wide, nearly circular; under arm-plates squarish or pentagonal; more or less blue......*cyanosticta*

f′ Disk-scales much finer, 7–11 series in each interbrachial area; oral shields distinctly longer than wide; under arm-plates widely in contact, broader than long.

g Interbrachial areas below nearly naked; oral shields bud- or acorn-shaped; adoral plates meeting radially.*quadrispina*

g′ Interbrachial areas below covered with plates; oral shields spearhead-shaped; adoral plates not meeting radially *conferta*

d′ Radial shields small, their length about $\frac{1}{3}$ radius of disk or even less.

e Arm-spines 4 or 5; disk-scaling not very coarse, 6 series or more in each interbrachial area; usually (perhaps always) 5 arms.

f Disk-scaling fine, 11–15 series in each interbrachial area.*carnea*

f′ Disk-scaling coarser, 6–9 series in each interbrachial area.

g Numerous spines in interbrachial areas below; under arm-plates somewhat quadrilateral, wider than long...*africana*

g′ No spines in interbrachial areas; under arm-plates at base of arm somewhat triangular, soon becoming more or less circular......................................*lütkeni*

e′ Arm-spines 3 or 4; disk-scaling coarse, about 5 series in each interbrachial area; usually 6 arms.

f Radial shields exceedingly small, no larger than some of the disk-plates......................................*virens*

f′ Radial shields moderate, larger than any disk-plates.

g Spinelets present in interbrachial areas at least below; under arm-plates as wide as long or wider...............*arenosa*

g′ Spinelets lacking; under arm-plates longer than wide. *brachyaspis*

c′ 2 oral papillae on each side of each jaw.

d 7 arms; radial shields short and well-separated...........*hirta*

d′ 5 or 6 arms.

e Arm-spines long, middle ones much exceeding segment and usually equalling or exceeding arm width; disk-scaling coarse; disk-spines numerous all over body in adults but lacking on upper surface of disk in young.......................*asperula*

e′ Not as above.

f Arm-spines 7 or 8, upper ones very slender and pointed, much shorter than segment...........................*hemiteles*

f′ Arm-spines usually 4 or 5, rarely more and then in very large specimens, stout and blunt or bluntly pointed.

g Disk-scales coarse about 5 series in each interbrachial area where narrowest; these areas below, more or less naked in adults.

- *h* Oral shields much wider than long; upper arm-plates with even margins and not at all swollen.......*mülleri*
- *h′* Oral shields about as long as wide; upper arm-plates swollen, distal margin often with 2 very slight notches, much as in *O. savignyi*...................*gymnochora*

g′ Disk-scaling finer, 7 or more series in each interambulacral area; these areas below, fully covered with scales; under arm-plates squarish; 5 arm spines.

- *h* Upper arm-plates inclined to be tetragonal, wider distally than proximally and somewhat angular..........*maculosa*
- *h′* Upper arm-plates distinctly ellipsoidal.
  - *i* Oral shields much wider than long; adoral plates with no distally projecting angle separating oral shields from side arm-plates.............................*resiliens*
  - *i′* Oral shields about as long as wide; adoral plates with a distally projecting angle separating oral shields from side arm-plates...........................*nomentis*

OPHIACTIS SYMBIOTA.

H. L. Clark, 1916. ENDEAVOUR Ech., p. 88, pl. 36.

Only a single specimen of this well-marked species is known and the number of oral papillae, while apparently 2, is not certainly determined. The disk-covering is, however, very distinctive. The type-locality is in Bass Strait, Australia, 100–300 fms.

OPHIACTIS PLANA.

Lyman, 1869. Bull. M. C. Z., **1**, p. 330. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 10, fig. 1, 2.

Ophiactis flexuosa Lyman, 1879. Bull. M. C. Z., **6**, p. 37. 1882. CHALLENGER Oph., pl. 20, fig. 1–3.

Ophiactis perplexa Koehler, 1897. Ann. sci. nat. Zool., ser. 8, **4**, p. 327, pl. 7, fig. 40, 41.

Ophiactis profundi Lütken and Mortensen, 1899. Mem. M. C. Z., **23**, p. 140, pl. 6, fig. 4–6.

Ophiactis brachygenys H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 135, fig. 51.

A careful comparison of type-material of *O. plana*, *O. flexuosa*, *O. profundi*, and *O. brachygenys*, with each other and with an excellent specimen of *O. perplexa*, identified by Koehler, has satisfied me that all represent a single species, and even the individual diversity is very slight. The geographical and bathymetrical ranges are both notable, extending from the vicinity of the Azores Islands in 361–508 fms. to the southeastern coast of the United States, and the Gulf of Mexico in 26–225 fms., and from the Gulf of Panama westward to the Indian Ocean. Specimens are known from near the Kermadec Islands in 600 fms., from southeastern Japan, 120–720 fms. and from near Ceylon, 719 fms. In the Panamic region, this species was taken in 899 fms. while in the East Indies, the SIBOGA took one specimen in 1,048 fms. The specimens recorded from less than 100 fms. are all young and the possibility of erroneous identifications is great. Indeed, the specimen recorded in Mem. M. C. Z., **25**, p. 264, from Bermuda, proves to be *O. lymani.*

OPHIACTIS MACROLEPIDOTA.

Marktanner-Turneretscher, 1887. Ann. K. k. naturh. Hofmus. Wien, **2**, p. 298, pl. 12, fig. 12–13.

This species is as yet known only from the type-specimen in Vienna. It came from "Sidney," presumably Sydney, New South Wales.

OPHIACTIS LUTEOMACULATA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 263, pl. 11, fig. 7, 8.

It is possible that this species is identical with the preceding, but until more and better material is available, their relation cannot be determined. The type of *O. luteomaculata* is from the Murray Islands, Torres Strait, but other specimens are known from the coast of New South Wales, in 27–29 fms.

OPHIACTIS BRACHYURA.

Döderlein, 1898. Jena. denkschr., **8**, p. 485, pl. 37, fig. 2, 2*a*.

This species is based on an obviously very young specimen from Amboina, but the exceedingly short arms and relatively large number of arm-spines are distinctive features.

OPHIACTIS NAMA.

Lyman, 1879. Bull. M. C. Z., **6**, p. 38. 1882. CHALLENGER Oph., pl. 20, fig. 16–18.

This species is known only from the Kermadec and Fiji Islands, 210–610 fms.

OPHIACTIS PTEROPOMA.

H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 134, fig. 50.

The only known localities for this species are on the coasts of Japan, in 191–253 fms.

OPHIACTIS DELICATA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 260, pl. 11, fig. 9, 10.

The unique holotype of this species was taken at the Murray Islands, Torres Strait, apparently commensal on a comatulid.

OPHIACTIS BALLII.

Ophiocoma ballii Thomson, 1840. Ann. nat. hist., **5**, p. 99.
Ophiactis ballii Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 126.
Amphiura ballii Sars, 1861. Ov. Norges Ech., pl. 2, fig. 1–6.

This long-known species is found about the coasts of the British Isles and Scandinavia, down to a depth of 203 fms.

OPHIACTIS LYMANI.

Ljungman, 1871. Öfv. Kongl. vet.-akad. Förh., **28**, p. 629.

Plate 4, fig. 5, 6.

Except for two specimens from near the Cape Verde Islands, recorded as *O. lymani* by Koehler, this species has hitherto been known only from the original specimen, from Salt Island, Virgin Islands, in 30–40 fms. It was therefore a matter of much interest to find it common in coralline Algae in Buccoo Bay, Tobago, in April, 1916. None of the specimens taken is larger than Ljungman's type and all agree well with his description. In life the color is distinctly grayish, not green as in *O. savignyi*, and the arms are plainly banded with darker gray or with dull red. The gray of disk and arms is not uniform but variegated with lighter and darker shades. The most distinctive feature of the coloration is a dusky spot on the upper side of two or three of the upper arm-spines in each series. This spot, referred to by Ljungman, is usually very evident but it is sometimes faint and occasionally seems to be wanting. It is very faint in a specimen from Fairyland Bay, Bermuda, recorded in Mem. M. C. Z.,

25, p. 264 as *O. plana*. Comparison of this specimen with the Tobagoan material makes their identity certain.

The specimens of Ophiactis taken by the PRINCESSE-ALICE near the Cape Verde Islands in 1901, and identified by Koehler as *O. lymani* seem very dubious. They are certainly very different from my Tobagoan specimens unless Koehler's figures are quite misleading. The very fact that two oral papillae are present is sufficient to make one hesitate to accept them as *O. lymani*. In view of the peculiar upper arm-plates, the very small radial shields, the unusual arm-spines and the characteristic mouth-parts, these Cape Verde Islands specimens will probably prove to represent an undescribed species.

In June, 1917, I found *O. lymani* rather common at the Tortugas. The individuals are, however, more brightly colored than those from Tobago, the gray being strongly tinged with, or replaced by, rusty brown.

OPHIACTIS DYSCRITA.

H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 137, fig. 52.

This species is known only from the holotype, which was taken in Kagoshima Gulf, Japan, in 58 fms.

OPHIACTIS ABYSSICOLA.

Amphiura abyssicola Sars, 1861. Ov. Norges Ech., p. 18, pl. 2, fig. 7–12.
Ophiactis abyssicola Ljungman, 1867. Öfv. Kongl. vet.-akad. Förh., **23**, p. 324.
Ophiactis cuspidata Lyman, 1879. Bull. M. C. Z., **6**, p. 38. 1882. CHALLENGER Oph., pl. 20, fig. 10–12.
Ophiactis poa Lyman, 1879. Bull. M. C. Z., **6**, p. 40. 1882. CHALLENGER Oph., pl. 20, fig. 13–15.
Ophiactis corallicola Koehler, 1895. Rev. biol. Nord France, **7**, p. 24, fig. 5.
Ophiactis echinata Koehler, 1898. HIRONDELLE Ech. et Oph., p. 48, pl. 5, fig. 15, 16.

Type-material of *O. cuspidata* is absolutely indistinguishable from *O. abyssicola* of the same size. Type-material of *O. poa* is less exactly similar but the differences are so slight, no stress can be laid on them. I cannot distinguish in either the descriptions or figures of *O. echinata* and *O. corallicola* any tangible distinctive characters. The very youthful character of the unique holotype of *O. echinata* is obvious and I do not see why the specimen is not exactly what one would expect a very young *O. abyssicola* to be. I believe therefore that we have in *O. abyssicola*, as in *O. plana* (probably), a cosmopolitan, deep-water Ophiactis, known as yet however only from the north and south Atlantic and from the Pacific near the Kermadec Islands, in 64–945 fms.

OPHIACTIS CANOTIA.

Lyman, 1879. Bull. M. C. Z., **6**, p. 38. 1882. CHALLENGER Oph., pl. 19, fig. 16–18.

The only known locality for this species is near the Azores Islands at a depth of 1,000 fms.

OPHIACTIS LORICATA.

Lyman, 1869. Bull. M. C. Z., **1**, p. 331. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 10, fig. 3, 4.

This interesting little species is known as yet only from near Alligator Reef, Florida, in 110 fms. The upper arm-plates are quite different from those of any other Ophiactis even when very young specimens are used for comparison.

OPHIACTIS SAVIGNYI.

Ophiolepis savignyi Müller and Troschel, 1842. Syst. Ast., p. 95.
Ophiactis savignyi Ljungman, 1867. Öfv. Kongl. vet.-akad. Förh. **23**, p. 323.
Ophiactis krebsii Lütken, 1856. Vid. med., p. 12.
Ophiactis virescens Lütken, 1856. Vid. med., p. 24.
Ophiolepis sexradia Grube, 1857. Arch. f. naturg., **23**, 1, p. 343.
Ophiactis reinhardtii Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 161, pl. 3, fig. 7*a*, *b*.
Ophiactis incisa von Martens, 1870. Arch. f. naturg., **36**, 1, p. 248.
Ophiactis brocki de Loriol, 1893. Rev. Suisse zool., **1**, p. 401.

The diversity of characters shown by this tropicopolitan species is not very extraordinary but growth-changes are considerable and the customary multiplication by fission causes many superficial differences. There is no doubt, however, that the multiplicity of names is due more to its unusually extensive range than to differences of structure. The characters by which it may be recognized have been given above in the key but it may be added that the number of arms is typically 5 or 6, though individuals with 4 or 7 are by no means rare. The species occurs most abundantly in the cavities of sponges in very shallow water but it also occurs in crevices in rocks, in and among corals, and in coralline Algae. Full-grown specimens, with disk 6 mm. across and arms 35–40 mm. long are relatively rare, the great bulk of specimens collected having the disk only 2 or 3 mm. across. The synonymy given above has been generally accepted of recent years with two exceptions. Verrill has maintained that *O. krebsii* is distinct (but he has given no reasons for his belief) while *O. brocki* has not hitherto been considered identical with *O. savignyi*. A critical examination of de Loriol's description leaves no doubt however that his type was an adult of this species; the description of the upper arm-plates is particularly convincing. As for *O. krebsii*, I fully agree with Koehler as to its identity with *O. savignyi*.

It is quite possible that the names in use for the West Indian species of *Ophiactis*, *O. mülleri*, and *O. savignyi*, are not only not the first names applied to the respective forms, but are not now used as Lütken originally used them. Nothing whatever would be gained, however, by an attempted readjustment.

OPHIACTIS KRÖYERI.

Lütken, 1856. Vid. med., p. 24. 1859. Add. ad hist. Oph., pt. 2, pl. 3, fig. 8 *a-c*.

Ophiolepis atacamensis Philippi, 1860. Reise durch der wueste Atacama, p. 190.

Ophiactis fragilis Ljungman, 1866. Öfv. Kongl. vet.-akad. Förh., **23**, p. 164.

The occurrence of this species along the western coast of South America from Payta, Peru, to Talcahuano, Chile, and also at the Hawaiian Islands is almost unbelievable, in view of the almost total difference between the echinoderm faunas of the two regions. But there is no doubt that the specimens on which *O. fragilis* is based and which were said to be from the Hawaiian Islands are identical with South American specimens. If *O. kröyeri* really occurs at the Hawaiian Islands, it was probably introduced on the bottom of some vessel. So far as I know, there are no recent records.

OPHIACTIS SIMPLEX.

Ophiolepis simplex Leconte, 1851. Proc. Acad. nat. sci. Phila., **5**, p. 318.

Ophiactis oerstedii Lütken, 1859. Add. ad. hist. Oph., pt. 2, p. 129.

Ophiactis simplex Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 130. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 10, fig. 5, 6.

This is a northern representative of the preceding species and it is quite possible that the two are not distinct. It ranges northward from Panama to the Gulf of California but it has been taken at only a very few places and is very imperfectly known.

Ophiactis modesta.

Brock, 1888. Zeitschr. f. wiss. zool., **47**, p. 482. Döderlein, 1896. Jena. denkschr., **8**, pl. 15, fig. 5–5*b*.

This species is known only from Amboina, and Thursday Island, Torres Strait.

Ophiactis affinis.

Duncan, 1879. Journ. Linn. soc. Zool., **14**, p. 469, pl. 10, fig. 23, pl. 11, fig. 24.

Little is known of this species, the type-locality of which is "Korean Seas."

Ophiactis cyanosticta, sp. nov.

κύανος = dark blue + στικτός = marked, in reference to the coloration.

Plate 4, fig. 3, 4.

Holotype.— M. C. Z. 4,149, and numerous *Paratypes*, M. C. Z. 4,150, 4,194. British West Indies: Tobago, Buccoo Bay, April, 1916, in coralline Algae and among coral fragments. Carnegie Expedition. H. L. Clark coll.

Disk, 3 mm. in diameter; arms *six*, 10 mm. long. Disk covered by a coat of moderately coarse scales among which the primaries are visible but not conspicuous; there are about *five* series of scales in the interradial areas at the narrowest point; the interbrachial areas below are covered by much smaller scales, some of which bear low spinelets; a number of the spinelets are visible from above, occurring along the margin of the interradial area. Radial shields about equal to one half radius of disk and fully twice as long as wide; distally they are in contact but proximally they are well-separated. Upper arm-plates fully twice as wide as long, distal as well as proximal margins perfectly straight but proximal much shorter; lateral margins rounded; greatest width of plate near distal margin. Oral shields pentagonal or rounded triangular as wide as long or wider. Adoral plates elongated triangular, nearly or quite meeting radially but not interradially, where they are more or less separated by the oral shield; the distal angle does not extend down between the oral shield and the side arm-plate. Oral papilla one on each side, large and nearly circular. Under arm-plates pentagonal or hexagonal; near middle of arm, they are distinctly pentagonal with a sharp proximal angle, the three distal sides slightly concave, and the distal angles rounded; they are longer than wide and barely in contact; basally, however, they are more and more broadly in contact and hence become hexagonal and some at least are wider than long. Side arm-plates low and small; each carries a series of 4 (or 3) short, thick, blunt spines, scarcely as long as the arm-segment; the uppermost or next lower is biggest. Tentacle-scale 1, large and oval. Color, in life and in dried specimens, which have not been in alcohol, variegated dull bluish green and whitish, with irregular spots and markings of a dull blue. The colors are little affected by alcohol.

This little Ophiactis occurs with *O. lymani* and *O. savignyi* in great numbers in the coralline Algae in the shallow parts of Buccoo Bay. It is always easily recognizable by the blue color but it was not until preserved material was critically studied that it became evident it is not a mere form of *O. savignyi,* as was supposed when the material was gathered. The presence constantly of only one oral papilla and the entire absence of swelling or notching of the upper arm-plates are good evidence that *O. cyanosticta* is not identical with *O. savignyi* and the single oral papilla separates it from young *O. mülleri* even regardless of the distinctive coloration.

OPHIACTIS QUADRISPINA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 264, pl. 10, fig. 9, 10.

This species is known only from the Philippine Islands.

OPHIACTIS CONFERTA.

Koehler, 1905. SIBOGA-exp. Oph. litt., p. 25, pl. 3, fig. 15–17.

The only known locality for this species is near the island of Salawatti, Dutch East Indies, in 10 fms.

OPHIACTIS CARNEA.

Ljungman, 1867. Öfv. Kongl. vet.-akad. Förh., **23**, p. 324.

This seems to be the characteristic species of South Africa and is not known from elsewhere.

OPHIACTIS AFRICANA.

Koehler, 1911. Ann. Inst. ocean., **2**, fasc. 5, p. 17, pl. 3, fig. 4, 5.

This species has been taken only at two widely separated points (Levrier Bay and Banana) on the west coast of tropical Africa.

OPHIACTIS LUTKENI.

Marktanner-Turneretscher, 1887. Ann. K. k. naturh. Hofmus. Wien, **2**, p. 298, pl. 12, fig. 7, 8.

This is another African species, known as yet only from Fernando Po.

OPHIACTIS VIRENS.

Amphiura (*Ophiactis*) *virens* Sars, 1857. Nyt. mag. naturvid., **10**, p. 39.
Ophiactis virens Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 126. Simroth, 1876. Zeitschr. f. wiss. zool., **27**, pl. 31, fig. 1–4.

This is the common and well-known Mediterranean species.

OPHIACTIS ARENOSA.

Lütken, 1856. Vid med., p. 25. McClendon, 1909. Univ. Cal. publ. Zoöl., **6**, pl. 3, fig. 16, 17.

The Central American and Mexican coast, north to San Diego, California, is the home of this long, but little, known species.

OPHIACTIS BRACHYASPIS.

H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 138, fig. 53.

The locality of the unique holotype of this species is unfortunately not known.

OPHIACTIS HIRTA.

Lyman, 1879. Bull. M. C. Z., **6**, p. 39. 1882. CHALLENGER Oph., pl. 20, fig. 4–6.

The unique holotype of this species was taken in 400 fms., off Sydney, New South Wales. The specimen from the north Atlantic, taken by the PRINCESSE-ALICE and referred to this species by Koehler had only six arms and the disk was only 3 mm. in diameter. It was possibly a young *O. abyssicola* but a reëxamination of the upper arm-plates would no doubt determine that.

OPHIACTIS ASPERULA.

Ophiolepis asperula Philippi, 1858. Arch. f. naturg., **24**, 1, p. 267.
Ophiactis asperula Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 130. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 10, fig. 11, 12.
Ophiactis magellanica Ljungman, 1866. Öfv. Kongl. vet.-akad. Förh., **23**, p. 164.

This species is characteristic of the southern coasts of South America on both sides of the Strait of Magellan.

OPHIACTIS HEMITELES.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 262, pl. 10, fig. 7, 8.

The only known specimen of this species is from the Murray Islands in Torres Strait.

OPHIACTIS MÜLLERI.

Lütken, 1856. Vid. med., p. 12. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 11, fig. 5, 6.
Ophiactis ljungmani Marktanner-Turneretscher, 1887. Ann. K. k. naturh. Hofmus. Wien, **2**, p. 297, pl. 12, fig. 9–11.
Ophiactis dispar Verrill, 1899. Bull. Univ. Iowa, new ser. **1**, no. 6, p. 31, pl. 8, fig. 3–3c.
Ophiactis longibrachia H. L. Clark, 1901. Bull. U. S. F. C., **2**, p. 246, pl. 14, fig. 1–5.

The exact range of this species is uncertain because young and half-grown specimens are so easily confused with *O. savignyi*, but it is supposed to extend throughout the West Indian region from South

Carolina to Brazil. Full-grown adults are easily distinguished not only by the size, the maximum for the genus (disk 10–15 mm. across), but by the very dark color which in preserved material may be nearly black. There is no one character by which the species can be certainly distinguished from *O. savignyi* but the upper arm-plates usually answer the purpose. As I have never taken a specimen either in Bermuda, Jamaica, or Tobago, which could be referred to *O. mülleri*, I have long been, and still am, in doubt as to the real status of the species. But, it must be admitted, I have never found a specimen of *O. savignyi* nearly so large or so dark colored as adult *O. mülleri*. At the Tortugas in June, 1917, we dredged a few specimens which seem to belong to this species. The largest, which is certainly not *O. savignyi*, is 7 mm. across the disk and has arms 50 mm. long. The color in life was very striking, utterly different from any other Ophiactis I have seen alive; the disk was gray at center but, becoming gradually rusty red on the margin, was bright pinkish red in the interbrachial areas below; interradially above it was variegated with black and white; oral surface white with a reddish tinge; upper surface of arms buff, variegated with black, light, and dark brown and white so as to appear indistinctly banded; upper surface of arm-spines like upper arm-plates. In the preserved specimen the red and brown shades have disappeared and there is an evident greenish tinge.

OPHIACTIS GYMNOCHORA.

H. L. Clark, 1911. Bull. 75 U. S. N. M., p. 139, fig. 54.

Although this species, taken at Tanegasima, Japan, is superficially very different from *O. savignyi*, it is quite possibly only a variety of that species. The upper arm-plates have the swollen, slightly notched appearance characteristic of *O. savignyi*, indicated to at least some degree.

OPHIACTIS MACULOSA.

Von Martens, 1870. Arch. f. naturg., **36**, 1, p. 248. H. L. Clark, 1915. Mem. M. C. Z., **25**, pl. 11, fig. 3, 4.

In the Memoir above quoted, I have listed 18 specimens of *O. maculosa* in the M. C. Z. collection. Critical study of this material shows that half of it is in reality *O. savignyi*, and I have even inclined to the view that the two species are identical. But in the other half of the *O. maculosa* material the finer scaling of the disk is noticeable and the upper arm-plates are not at all swollen or notched. The two species may therefore be considered distinct.

OPHIACTIS RESILIENS.

Lyman, 1879. Bull. M. C. Z., **6**, p. 36. 1882. CHALLENGER Oph., pl. **20**, fig. 7–9.

This is the characteristic Ophiactis of southeastern Australia.

OPHIACTIS NOMENTIS.

Farquhar, 1907. Trans. N. Z. inst., **39**, p. 125. H. L. Clark, 1915, Mem. M. C. Z., **25**, pl. 11, fig. 1, 2.

This species is known only from Cape Maria van Dieman, New Zealand. It is very near the preceding, though apparently larger, but if the differences in the oral shields and adoral plates prove to be constant, the two forms may well be kept apart.

OPHIOTRICHIDAE.

OPHIOTHRIX ANGULATA.

Ophiura angulata Say, 1825. Journ. Acad. nat. sci. Phila., **5**, p. 145.
Ophiothrix angulata Ayres, 1852. Proc. Boston soc. nat. hist., **4**, p. 249.

Few brittle-stars have their specific characters as little fixed as this common and long-known species. It ranges from North Carolina southward to the Rio Plata, perfectly unmistakable examples from each of these regions being in the M. C. Z. collection. We also have specimens from Vera Cruz, from Yucatan, and from the north coast of Panama as well as from Florida and many of the West Indian Islands. Verrill records it from the Bermudas and from Chesapeake Bay. The last record is probably incorrect, as elsewhere Verrill records the northernmost record as 35° 21′ N. in 16 fms., and in a subsequent paper he gives Cape Hatteras as the northernmost point. The bathymetrical range is also notable, extending from low-water mark to below 150 fms. (BLAKE Exp.) and to 200 fms. (Verrill). As a rule, specimens from deep water are not typical but one in the

M. C. Z. collection, taken by the BLAKE, and said to be from off St. Vincent in 124 fms., is exactly like ordinary shallow-water specimens. It was perhaps not actually dredged at so great a depth.

The diversity shown by this species extends to all the characters by which species in the genus are to be distinguished. The covering of the disk varies greatly; in typical specimens there is a more or less dense coat of minute bifid or trifid stumps, which covers to some extent at least the radial shields, but it is very common to find longer, acute, rough spinelets scattered among the stumps and frequently the spinelets are very numerous; in extreme cases there are no stumps at all. Often the radial shields are perfectly bare and they may be also very large and sharply set off from the disk-covering. Even the upper and under arm-plates and also the oral shields show no constancy to any characteristic form. The arm-spines are usually rough and pointed, but the upper ones are often more or less markedly flattened and sometimes, when not flattened, they are almost smooth. In coloration, the diversity is so great that it is difficult to decide what is the typical form but there is commonly a white longitudinal stripe on the upper side of the arm, which is quite characteristic. This stripe is, however, frequently wanting and such specimens can then be assigned to *O. angulata* only by becoming satisfied that they are not *O. brachyactis*, *O. lineata*, *O. örstedii*, *O. pallida*, or *O. suensonii!*

To bring some sort of order into this heterogeneous assemblage, I distinguish some of the recognizable forms as varieties and designate six of these, giving them names expressive of their distinctive character.

KEY TO THE WEST INDIAN SPECIES AND VARIETIES.

a Arms beautifully and regularly cross-banded with dark or colored lines which are bounded on each side with white or yellow.
  b Ground color some shade of green, purple, or brown.......... *örstedii*
  b' Ground color bright orange-chrome.................. *örstedii* var. *lutea*
a' Arms not so cross-banded.
  b A distinct, median, colored or black line on upper surface of arms.
    c No spines or spinelets on disk but only very low, rough granules *lineata*
    c' Disk with spines or spinelets.
      d Radial shields very large and perfectly bare, the narrow areas between with few, long, slender spines................ *suensonii*
      d' Radial shields moderate or small, at least the inner ends with minute spinelets.

        e Longitudinal line on arm not black but purplish or reddish; disk with both spines and bifid or trifid stumps..............*pallida*
        e′ Longitudinal line on arm, black; no spines on disk *angulata* var. *atrolineata*
b′ No median colored line on arm.
    c A median white line on upper surface of arms.
        d Radial shields large, sharply defined and perfectly bare *angulata* var. *megalaspis*
        d′ Radial shields moderate or small, not sharply defined and perfectly bare.
            e Color violet or deep blue, with more or less white *angulata* var. *violacea*
            e′ Colors very varied both in shade and distribution.....*angulata*
    c′ No median white line on arm.
        d Disk covered with large bare radial shields and relatively few distinct scales each of which carries a single low thorny stump. *brachyactis*
        d′ Disk not as above.
            e Unicolor.
                f Color very deep crimson, well-retained by dry specimens *angulata* var. *phoinissa*
                f′ Color brilliant orange-red, almost completely lost in preserved material..........................*angulata* var. *phlogina*
            e′ Colors varied, well-retained in preserved material; arms more or less banded.......................*angulata* var. *poecila*

OPHIOTHRIX ÖRSTEDII var. LUTEA, var. nov.

luteus = orange-colored.

Holotype.— M. C. Z., 4,158. British West Indies: Tobago, Buccoo Reef. April, 1917. Carnegie Expedition. John W. Mills coll.

Disk, 10 mm. in diameter; arms 65–70 mm. long. Similar to *O. örstedii* in all structural features, but of a brilliant, orange color, slightly dusky on the disk. The color is almost exactly that called "orange-chrome" by Ridgway (1912) and is very near Klincksieck's and Valette's (1908) no. 101. Examination with a lens shows that the arms are distinctly, transversely banded with a lighter shade, and the character of these markings is exactly like those shown by typical *O. örstedii.*

This beautiful brittle-star is so unlike any other Ophiothrix seen, in the vividness of its color, that it is hard to believe it is only an individual variant of *O. örstedii.* It seems entitled to a name as a well-marked variety for it is perfectly unmistakable in life and although the color of the preserved specimen has become dingy, it could not be confused with any other form.

OPHIOTHRIX LINEATA.

Lyman, 1860. Proc. Boston soc. nat. hist., **7**, p. 201.

This fine species is fairly common at the Tortugas, Florida, but seems to occur only in Siphonochalina and other sponges; at least, none were seen elsewhere. In all of its characters including coloration, it is one of the least variable members of the genus and even growth-changes are slight after the disk is two mm. across. The series taken at the Tortugas ranges from 2 to 12 mm. in disk-diameter. It is interesting to note that the largest specimen has not only the actually, but also the relatively, longest arms; in the smallest specimen, the arms are 10–12 mm. long, or 5–6 times the disk-diameter while in the largest, they are more than 120 mm. long or fully 10 times the disk-diameter.

OPHIOTHRIX PALLIDA.

Ljungman, 1871. Öfv. Kongl. vet.-akad. Förh., **28**, p. 626.

Koehler has given some excellent figures and a detailed description (1913. Zool. jahrb. Suppl., **11**, p. 377, pl. 20, fig. 5, pl. 21, fig. 10, 11) of a type-specimen from the Stockholm Museum, of this rare species. He refers to the specimen as "unique" but in this he is certainly mistaken as there is, in the M. C. Z. collection, a specimen received from the Stockholm Museum, collected in 180 fms. near Anguilla by Dr. Goës, and hence unquestionably one of Ljungman's types. Indeed from the fact that the disk is nearly 5 mm. across in the M. C. Z. specimen, which is the measurement given by Ljungman, while the Stockholm specimen is, Koehler says, only 3 mm. across, it might be inferred that ours is the specimen on which the original description is based. The matter is not important, however, for the specimens are alike in all particulars. Lyman was of the opinion that *O. pallida* was near *O. angulata,* while Koehler says it belongs to a different "group," and he seems to consider it in the same "group" or section as *O. suensonii.* In this I decidedly agree with Lyman, as there is no indication of a near relationship with *O. suensonii* but on the contrary, were it not for the colored stripe on the upper side of the arm I should be at a loss to distinguish *O. pallida* from *O. angulata;* in the spinulation of the disk, in the form of the upper and under arm-plates and in the arm-spines, the type-specimen of *O. pallida* before me can be almost exactly matched from our large series of *O. angulata.*

OPHIOTHRIX ANGULATA var. ATROLINEATA, var. nov.

ater = black + *lineatus* = with lines, in reference to the marking of the arms.

Plate 5, fig. 3.

Holotype.— M. C. Z., 4,154. British West Indies: Tobago, Buccoo Bay, April, 1916. Carnegie Expedition. H. L. Clark coll.

Although the specimen on which I base this variety is very young (disk, 3 mm., arms, 12–15 mm.), the coloration is so distinctive it seems worthy of a name. The upper surface of disk and arms is lavendar, with the arm-spines of practically the same tint; orally the specimen is whitish. On the upper side of each arm is a broad, longitudinal, very black line, which does not extend on to the disk.

The conspicuous line on the arm suggests that this specimen might be a hybrid between *O. angulata* and *O. suensonii*, but there is nothing else in the structure to indicate such an origin. As the dorsal stripe on the arm in *O. angulata* is usually white, the present specimen represents an extraordinary variety.

OPHIOTHRIX ANGULATA var. MEGALASPIS, var. nov.

μέγας (μεγαλ) = big + *ἀσπίς* = shield, in reference to the large radial shields.

Plate 8, fig. 3.

Holotype.— M. C. Z., 4,223. Gulf of Mexico: off northeastern Yucatan, 51 fms. BLAKE Station (1880) XXX. J. R. Bartlett coll.

Disk 7 mm. in diameter; arms 30–35 mm. long. Disk covered by a coat of relatively coarse but not very distinct scales, most of which bear short, slender, thorny spinelets; a few bear bifid or trifid stumps and a few are naked. Radial shields large, triangular, 2.3 mm. long by 1.3 mm. wide, in contact only at distal tip but only very slightly separated elsewhere; each shield is very smooth and sharply defined. Color bright pink in the dry specimen; on the upper side of each arm is a median white stripe bordered by a dull rose-purple stripe of somewhat variable width; the white stripe is occasionally interrupted, and is now and then crossed by a narrow dash of rose-purple; the rose-purple stripes are also occasionally interrupted; under arm-plates prettily marked with pale rose-purple and whitish; near arm-tip the rose-purple occupies the sides of the plate, the whitish forms a median longitudinal line.

A specimen very similar to the above, but with a somewhat smaller disk and longer arms, and with the colors almost completely faded is M. C. Z. 2,307. It was taken in 1878 by the BLAKE at station 45, northwest of the Tortugas, in 101 fms. I have no doubt that it is also *O. megalaspis,* and it is fair to say therefore that this variety occurs in deep water (50–100 fms.) in the Gulf of Mexico. There are faint indications in M. C. Z. 2,307 that its color-pattern in life, if not its coloration, was similar to that of M. C. Z. 4,223.

OPHIOTHRIX ANGULATA var. VIOLACEA.

Ophiothrix violacea Müller and Troschel, 1842. Syst. Ast., p. 115.

The original description is brief but refers to the white stripe on the arm. Verrill, (1899. Bull. Univ. Iowa, new ser., 1, no. 6, p. 19) states of certain specimens of *Ophiothrix angulata* — "The rest agree with the variety *violacea* (M. & Tr.), the back of the arms being irregularly marked and spotted with whitish and dark grayish blue or brown, according to the general color." It is hard to see on what grounds these specimens are referred to *O. violacea,* for that name must be used, if at all, for specimens, that have the ground-color violet or deep blue and have a distinct white line on the arm. Typical specimens are easily recognized but intergrades with ordinary *O. angulata* and with *O. angulata* var. *poecila* are very common, and I believe Verrill's specimens were of the latter sort, though it is quite possible that they were var. *poecila.*

OPHIOTHRIX ANGULATA var. PHOINISSA, var. nov.

φοίνισσα = deep crimson, in reference to the very dark coloration.

Holotype.— M. C. Z. 4,224 and *Paratype,* M. C. Z. 4,225. Cuba: Coutoy, on weedy rocks. Wm. Stimpson coll.

My attention was first attracted to this variety while dredging at the Tortugas. Two specimens were taken in one haul and their very deep uniform color and relatively short arms led to the impression that they were something new. Later examination showed that the short arms were due to the fact that all were regenerating, and this youthful portion has the white stripe so characteristic of *O. angulata*. The material in the M. C. Z. contains two specimens of *O. angulata* from Cuba which agree completely with the Tortugas specimens and the larger of these I have selected as the type of the variety. The disk is 9 mm. in diameter and the arms are about 40 mm. long. The disk is covered with numerous bifid and trifid stumps as in typical *O. angulata*, the relatively small radial shields being more or less bare. The color is uniformly deep purplish red, except that orally the mouth-frames and bases of the arms are yellowish white. The color is not so dark as in the Tortugas specimens but this may be the result of longer preservation. At the very tips of the arms faint indications of the dorsal stripe can be detected. In the smaller Cuban specimen (disk-diameter, 5 mm.) one arm is regenerating and this and the tips of the other arms are reddish white.

This is a very well-marked variety and will be easily recognized either in life or in museum material, but it is obviously only a color-form and no doubt intergradations with typical *O. angulata* occur. The Tortugas specimens were found in 6–8 fms. of water on a bottom covered with sponges.

Ophiothrix angulata var. phlogina, var. nov.

φλόγινος = flaming, in reference to the brilliant color.

Holotype.— M. C. Z. 4,220 and 8 *Paratypes*, M. C. Z. 4,221. Florida: Dry Tortugas, June, 1917, on bottom rich in sponges, 6–8 fms. Carnegie Expedition. H. L. Clark coll.

As in the case of the preceding form, my attention was attracted to this beautiful variety while dredging at the Tortugas. It is rather common there between Loggerhead and Garden Keys in 6–8 fms. on a bottom where sponges abound. The specimens taken were all small, the largest having the disk only 5–6 mm. across and the arms 20–25 mm. long. In the holotype, the entire upper surface was a brilliant red-orange while the under arm-plates and mouth-frames were yellowish. In most of the paratypes, the tips of the arms are more or less banded and intergradation with var. *poecila* is brought about by the extension of this banding until the arms are variegated as in that species though the disk may still be bright orange. In preserved material, the bright colors are entirely lost, although every effort was made to save them. The holotype is nearly uniformly pale pink. In the paratypes, the disk is either white or pink or pale purplish while the arms are pink or dull reddish.

Among the many specimens of *O. angulata* collected at Jamaica and at Tobago, I never saw an individual of this variety. It is so noticeable in life and so easily recognized that it seems desirable it should have a distinctive name.

OPHIOTHRIX ANGULATA var. POECILA, var. nov.

ποικίλος = variegated, in reference to the coloration of the arms.

Holotype.— M. C. Z. 4,222 and 13 *Paratypes,* M. C. Z. 4,153. British West Indies: Tobago, Buccoo Bay, April, 1916, in coralline Algae in very shallow water. Carnegie Expedition. H. L. Clark coll.

This is the least distinct and the most difficult to define of any of the varieties of *O. angulata* here named. It is very common in the coralline Algae of Buccoo Bay and the pretty coloration and especially the absence of a white line on the arm attracted attention to it. Dr. Mortensen soon discovered that whereas *Ophiothrix örstedii* and *O. angulata* were not breeding and the eggs could not be artificially fertilized at that time, this form was breeding and it was possible to secure the early stages of its development. We were therefore quite sure we were dealing with a distinct species but when I examined my material critically, I could not find any character or combination of characters which would distinguish these Buccoo Bay specimens from typical *O. angulata,* except the absence of a white stripe on the arm. And in many specimens, the white stripe can be detected, especially on the distal part of the arm.

At the Tortugas in June, 1917, this variety was common in water 6–8 fms. deep and clearly intergrades not only with the variety *phlogina,* but with variety *violacea* and with typical *angulata.* I therefore regard it as merely a variety, but the difference in breeding season indicates the existence of physiological, as well as of morphological, varietal characters.

It is a small form with the disk usually 3–5 mm. across and the arms five or six times the disk-diameter. Spinelets on the disk are usually quite wanting, the bifid and trifid stumps forming a uniform coat except on the radial shields which are more or less bare. But in some specimens spinelets are present and in the holotype, these, though few, are conspicuous because they are white in contrast with the purple disk. The coloration of the holotype is as follows:— disk purple, the outer margins of the radial shields and a few scattered spinelets, white; arm-spines purplish at base but becoming reddish at tip; upper arm-plates purplish, usually with the distal margin and a spot on each side of the proximal end, whitish; upper ends of side arm-plates also purplish with small markings of whitish; at intervals of one to three segments, the upper arm-plate and adjoining portions of side arm-plates are more or less red instead of purple; also at intervals of two or three segments the white margin of the upper arm-plate is wider; the general effect is that the arms are variegated with light dull red, white and purple but rather evidently banded with the red; under arm-plates with the sides purple, leaving a median stripe of whitish running the length of the arm. In preservation, the red shades are much decreased while the purple is deepened. Among the paratypes, there is much diversity of shade and of details of pattern but in few specimens is there now any trace of reddish left; the banded appearance of the arms persists very well however. In one specimen, the disk was bright yellow in life, but is now nearly white. The specimens collected at the Tortugas are distinctly lighter and redder than those from Tobago and many show the white stripe on the upper side of the arm more or less distinctly, at least near tip.

Among the paratypes are two specimens of more than ordinary interest. One is tetramerous; the disk is about 2 mm. across and two adjoining arms are 16–18 mm. long; the other two arms are only about 3 mm. long; there are four jaws; the specimen looks as though it were the result of schizogonous reproduction. The other individual is perfectly hexamerous; the disk is 5 mm. across and the arms about 25 mm. long.

OPHIOTHRIX BRACHYACTIS.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 269.

It was a great pleasure to find this species living in the coralline Algae in Buccoo Bay, Tobago, in April, 1916, but it is evidently not common there, as only two specimens were taken. One of these is smaller than the holotype but the other is a little larger, measuring

4 mm. across the disk; the arms are 13–15 mm. long; the disk-scales are remarkably large and distinct; the arms are faintly banded with darker and lighter bluish gray and distally there are inconspicuous whitish margins. The distinctness of this little species is fully confirmed by these Tobagoan specimens, none of the characters showing any tendency to intergrade with *O. angulata* or the other West Indian species. Although the type-locality for *O. brachyactis* is the Tortugas, I failed to find it among the hundreds of specimens of Ophiothrix which I collected and examined there in June, 1917.

OPHIOTHRIX DIRRHABDOTA, sp. nov.

διρραβδωτός = with two stripes, in reference to the markings on the arms.

Plate 5, fig. 1.

Holotype.— M. C. Z., 4,212 and 4 *Paratypes*, M. C. Z., 3,987. Philippine Islands: Mindoro, Port Galera, June, 1912. L. E. Griffin coll.

Disk, 5 mm. across; arms about 40 mm. long. Disk covered by a skin completely hiding the scales and carrying numerous opaque, thorny stumps and spinelets without regular arrangement. Radial shields large, separated, triangular; exact outlines hidden by skin; length about equal to two thirds radius of disk, and width about half as much; between them is a series of thorny spinelets and on the surface of each are half a dozen or more thorny stumps. Upper arm-plates quadrilateral, about as long as wide or nearly so; proximal margin shorter and straighter than distal which is quite convex; lateral margins concave; broadly in contact. Interbrachial areas below thickly covered with thorny stumps. Oral shields nearly triangular but with an evident convexity on distal margin, wider than long; madreporite larger and more nearly diamond-shape than the others. Adoral plates rather large, triangular, barely meeting within. Oral plates also rather large, with very large oral tentacle-pores. Tooth-papillae, numerous and small. First under arm-plate very small, rounded pentagonal, longer than wide; succeeding plates quadrilateral with rounded corners; first three longer than wide, but following twenty about as wide as long, remainder gradually becoming longer than wide again; proximal margin of plate shorter than distal, so lateral margins diverge a little distally; all under arm-plates, broadly in contact. Side arm-plates small with five or six arm-spines, of which the lowest is very small and the uppermost (of six) is small, smooth and terete; remaining spines rather glassy and thorny, the uppermost or fifth the longest and equalling two–two and a half arm-segments. Tentacle-scale single, sharp, rather flat. Color, dried specimen, disk, dull red, with its spinelets, stumps, and distal tips of radial shields, dirty whitish; ground-color of arms and arm-spines, reddish white; on the upper surface of each arm are two broad, longitudinal stripes of dull black, and on each side of arm, close to the upper ends of the side arm-plates, is a less distinct and more or less interrupted stripe of the same shade; none of the stripes have straight or sharply defined boundaries; lower surface of disk and arms dull red, with the madreporite and a conspicuous, median, rather broad longitudinal stripe on the under arm-plates, nearly white.

The paratypes are of particular interest as no two of them agree in color and none is like the holotype. The diversity of the species in that respect is well-shown, and it is both interesting and important to note that the *striping of the arms is a constant feature.* The most interesting specimen is the smallest; the disk is not quite 3 mm. across and is dull pinkish in color; its stumps and spinelets are much more slender than in the holotype; the arms and arm-spines are nearly white but dorsally on each side is a distinct though very narrow stripe of dull purple and ventrally the under arm-plates are purplish on both sides, leaving a broad white stripe down the middle; it is perfectly obvious that the only difference between this coloration and that of the holotype is that in the latter pigmentation is much heavier. A second specimen, 4 mm. across the disk is perfectly intermediate between the smallest specimen and the holotype not only in coloration but in the spinulation of the disk. A third specimen resembles the holotype in all particulars except that the ground-color is violet instead of reddish and all the oral shields are white. The fourth specimen is in very poor condition and seems to have been bleached; the dark stripes on the upper side of the arms can be detected only with difficulty, but the light stripe on the under arm-plates is perfectly obvious.

This new Ophiothrix is characterized by the striped arms, which are relatively longer than in *O. trilineata* and its allies but much shorter than in the *O. longipeda* group; by the disk-covering, the large upper arm-plates, the small side arm-plates and the few arm-spines. In all these features, it seems to be quite constant and well set off from the other members of the genus.

OPHIOTHRIX EURYCOLPODES, sp. nov.

ευρύς = *broad* + κολπώδης = *embayed,* in reference to the shape of the under arm-plates.

Plate 5, fig. 4.

Holotype.— M. C. Z., 4,213 and one *Paratype,* M. C. Z. 3,989. Philippine Islands: southern Luzon, Sorsogon, May, 1912. L. E. Griffin coll.

Disk, 7 mm. in diameter; arms about 25 mm. long. Disk covered by a large central plate, the big radial shields and 125–150 plates, arranged in three or four series around the central plate, a single series in each radius and in three or four series in each interradius; the radial and interradial plates are greatly elongated; a dozen or fifteen of these disk-plates, and a number of smaller plates at the interradial margins carry smooth, slender spinelets of no great length; the general effect is a bare, smooth disk. Radial shields very large, triangular, perfectly smooth, separated by the series of narrow radial plates; length equal to about three fourths of disk-radius and distal width about half as much. Upper arm-plates tetragonal, broadly in contact, wider than long; distal margin convex, decidedly longer than straight proximal edge. Interbrachial areas below nearly naked, carrying only a few small plates each of which bears a smooth, slender spinelet. Oral shields much wider than long, diamond-shaped, all angles rounded; proximal sides more or less concave, distal sides lightly convex. Adoral plates somewhat widened distally, but much longer than wide, scarcely or not meeting interradially. Oral plates very large with huge pores. Tooth-papillae numerous and small. First under arm-plate small, more or less triangular, about as long as wide; second and third plates, squarish with rounded corners, longer than wide; succeeding plates wider than long, with proximal margin straight and distal margin more and more conspicuously concave (or broadly embayed); owing to this concavity of the distal margin the plates are in contact only at the corners. Side arm-plates very small, not meeting either above or below; each carries a series of 4 or 5 long, slender, rather glassy arm-spines; the lowest is very small, the next much longer, and the third and fourth are twice as long as the width of arm; if a fifth is present it is shorter than the fourth; on the first arm-segment outside the disk a sixth, still smaller spine may be present; the sixth and fifth spines are smooth and pointed; the fourth and third are slightly flattened and blunt and are minutely thorny at the tip. Tentacle-scale single, not peculiar. Color, dry specimen, deep red, more or less variegated with whitish; it is difficult to decide how much of the lighter areas is due to rubbing off of the red skin, but certainly some of it is; the radial shields and radial plates are quite light and distally are reddish white.

The paratype, which is a little smaller, agrees well in all its structural features with the holotype but the coloration is very different. The red color is confined to the center and interradii of disk; radial shields and most of the upper arm-plates are dull green; a few scattered arm-plates are light brown; under surface variegated with greenish and white.

This species is well-characterized by its short arms, with few but long arm-spines, the nearly smooth disk with very large radial shields, the wide upper arm-plates and the shape of the under arm-plates. Its coloration is not reliable except in the absence of stripes or any other definite markings.

OPHIOTHRIX LEUCOTRIGONA, sp. nov.

λεμκός = white + τρίγωνον = triangle, in reference to the color-markings on the arms.

Plate 5, fig. 2.

Holotype.— M. C. Z., 3,988. Philippine Islands: Mindoro, Port Galera, June, 1912. L. E. Griffin coll.

Disk 5 mm. in diameter; arms about 20 mm. long. Disk covered by a thick skin which completely conceals any scales but bears numerous low but rather slender bifid or trifid stumps. Radial shields concealed by skin but apparently large, triangular, separated slightly their whole length; their surface is very smooth and nearly free from stumps. Upper arm-plates diamond-shaped, with both proximal and distal angles truncate and distal sides shorter than proximal; distally they are quite swollen; the outlines are much obscured both by skin and by the coloration but they seem to be distinctly longer than wide, except perhaps at base of arm. Interbrachial areas below covered by skin bearing a number of long and slightly rough spinelets. Oral shields much wider than long, somewhat narrowly diamond-shaped, with distal angle truncate and others rounded; proximal sides a little concave; madreporite distinctly larger than the others. Adoral plates long, very narrow, not much wider at inner ends where they meet, than at outer ends where they are well separated. Oral plates moderate with large oral pores. Tooth-papillae, rather few (12±) and large. First under arm-plate small; outlines obscure but apparently diamond-shaped, longer than wide; succeeding plates longer than wide, at first squarish with rounded corners, but gradually the proximal margin becomes strongly convex and the distal margin equally concave; they are more or less completely in contact throughout. Side arm-plates moderate, not meeting either above or below; each carries a series of 4 (at base of arm, 5) sharp, slender spines; lowest, except on basal three or four segments, is in form of a big, quadridentate hook, whose length (at middle of arm) equals width of an under arm-plate; second spine is longer, blunt and thorny at tip; third, much longer, less blunt, more thorny; fourth, longest, sharpest, quite thorny, its length exceeding width of arm; fifth (when present) shorter and smoother than fourth, pointed. Tentacle-scale, single, minute, pointed. Color, dry specimen, deep purple (almost black), with disk (especially on radial shields) microscopically and obscurely variegated with a lighter tint; mouth-frames and under arm-plates, white, in marked contrast; oral shields tinged with purple; scattered along upper surface of arms, frequently in longitudinal pairs are conspicuous usually triangular spots of white, with apex pointing distally; there are some 15–20 of these triangles on each arm; they are not so large as the upper arm-plates and do not coincide with them.

Aside from its very striking coloration, the combination of characters shown by the disk-covering, the upper and under arm-plates, and the few arm-spines will serve to distinguish this species.

OPHIOCHITONIDAE.

Ophionereis olivacea.

H. L. Clark, 1901. Bull. U. S. F. C., **2**, p. 248.

While detained at Key West early in June, 1917, I visited a small mangrove key about two miles north of the town. Here, in examining a handful of coralline Algae, I found a small brittle-star, which although an Ophionereis, was neither *O. reticulata* nor *O. squamulosa*. No similar specimen was found either near Key West nor at the Tortugas. Later special attention was given this little Ophionereis, and I am now satisfied that it is a young *O. olivacca,* a species hitherto known only from a single specimen, taken by the FISH-HAWK in February, 1899, in 6 fms. off the eastern end of Porto Rico. That specimen was 6 mm. across the disk and had arms about 33 mm. long. The specimen taken at Key West is 3.5 mm. in disk-diameter and the arms are about 21 mm. long. In only one particular is there any essential difference between the two. The small specimen has no yellow spots on the disk; in life it was bright olive-green and white, but in the preserved specimen, the green is now a deep gray. The characteristic, long, club-shaped middle arm-spine is noticeable on four or five of the basal arm-segments. The coarse scaling of the disk and the shape of the arm-plates are alike in the two specimens. The differences in coloration may then be construed as age-differences, as the Key West specimen is evidently immature, and the identity of the two specimens may be accepted.

OPHIONEREIS SQUAMULOSA.

Koehler, 1914. Bull. 84 U. S. N. M., p. 44.

It may be of interest to record that this pretty little species is very common in coralline Algae both at Buccoo Bay, Tobago and in the Tortugas region. It has hitherto been known only from St. Thomas (1 specimen) and from the vicinity of Parahiba Brazil (2 specimens). The previously known specimens were only 2–3 mm. across the disk but the adults rom Tortugas are 5–6 mm. across the disk and have arms, 40 mm. long. As a rule the color is very constant but one Tortugas specimen (M. C. Z. 4,226) was, and still is, conspicuous in having the ground-color light brown instead of the usual reddish white. Specimens in alcohol are more as Koehler says "brun-grisâtre."

OPHIOCOMIDAE.

OPHIOPSILA.

This is a very sharply defined genus, easily recognized by the remarkable tentacle-scales. Only four species were known to Lyman, who placed the group between Ophiophragmus and Ophionereis, but since 1898 six additional species have been described and the genus has been transferred to the Ophiocomidae, as first suggested by Verrill. The discovery of a new species at the Tortugas makes it desirable to publish a key to those now known. I have found no record of a species wrongly referred to the genus.

Ophiopsila was proposed by Forbes, (1843. Trans. Linn. soc. London, **19**, p. 149) for a brittle-star from the Aegean Sea, which he called *Ophiopsila aranea.* Some years later Sars (1857, Nyt. mag. naturvid., **10**, p. 23) described two species from the Mediterranean, for which he proposed a genus Ophianoplus. He thought it was distinct from Forbes's genus, because oral papillae were present and radial shields seemed to be wanting. As a matter of fact however, oral papillae and radial shields are present in both and it has been agreed for many years that Sars's generic name is a synonym of Ophiopsila. Of Sars's two species, one (*marmoreus*) has long been recognized to be a synonym of Forbes's *O. aranea,* while *O. annulosus* has been universally accepted as a valid species. It seems however, that there is much evidence to show that *O. annulosa* is simply full-grown *O. aranea.* The only differences that have been suggested are the smaller size and fewer, slenderer arm-spines of *O. aranea;* but in large specimens of *O. aranea* (8 mm. across the disk) there are 8 arm-spines, not at all slender, while Mangold (1907) figures an arm-segment of *O. annulosa* with only 10 arm-spines. Even the work of Mangold, Reichensperger, and Trojan on the phosphorescence of the Mediterranean species of Ophiopsila confirms the view that *O. aranea* is the young and *O. annulosa* the adult of a single species. Each of these authors treats them as distinct, without however, careful comparisons. In view of their distribution and all the other facts that are known, it would seem the two nominal European species might well be considered as really only one, for which Forbes's name would, of course, be used. One fact, however, weighs heavily against this course; the uppermost arm-spines are not the smallest in *O. aranea* as they are in *O. annulosa* and as they would naturally be if the increased number were simply a growth-change. As I have seen no specimens of *O. annulosa* and find none recorded with fewer than 10 arm-spines, I let the two species stand as they have for sixty years. An abundance of material will probably show they are identical.

In 1859, Lütken described (Add. ad hist. Oph., pt. 2, p. 136) a West Indian brittle-star, undoubtedly congeneric with *O. aranea;* it was taken at St. Thomas and was named *O. riisei,* in honor of its collector. Nearly twenty years passed before another member of the genus was discovered. Lyman (1878. Bull. M. C. Z., **5**, p. 227) then described *O. fulva* from deep water (175 fms.) off Havana, Cuba. The unique holotype (M. C. Z. 1,555) is in fairly good condition, though all the arms are broken. Whether this species has since been met with is doubtful. The specimens from the BLAKE collection which Mr. Lyman called *O. fulva* appear to be *O. hartmeyeri* Koehler and the same is probably true of some, if not all, the Porto Rican specimens recorded by me as *O. fulva* (1901. Bull. U. S. F. C., **2**, p. 245). A full twenty years elapsed before another Ophiopsila was reported, and then it was discovered in the Indian Ocean, among the islands of the Mergui Archipelago; to it Koehler gave the name *O. pantherina.* Since 1898, three additional species have been recorded from the West Indies, one from the east coast of southern Africa, and one from the Dutch East Indies. Apparently these are all valid species with well-marked characters.

Ophiopsila is so sharply defined and so isolated that Matsumoto ranks it in a subfamily of Ophiocomidae. Verrill has attempted to divide it into two genera but no other student has followed him and his Amphipsila is generally regarded as a synonym of Ophiopsila. Including the new species from the Tortugas, the eleven members of this genus may be distinguished from each other as follows: —

KEY TO THE SPECIES OF OPHIOPSILA.

a Arm-spines 10–12.
  b Uppermost arm-spines smallest........................... *annulosa*
  b′ Middle arm-spines smallest.
    c Arm-spines not very slender; tooth-papillae 4–6; upper arm-plates, at middle of arm, squarish or wider than long, with slightly rounded angles... *fulva*
    c′ Arm-spines very slender; tooth-papillae 8–10; upper arm-plates relatively longer and more rounded..................... *polyacantha*
a′ Arm-spines 8 or fewer.
  b Arm-spines only 4................................... *paucispina*
  b′ Arm-spines 6–8.
    c Disk, above and below, and at least basal part of arms more or less freely sprinkled with black dots.......................... *riisei*
    c′ No such sprinkling of black dots.
      d Tooth-papillae only 3, stout; arm-spines 7 or 8; disk with distinct scales, and brown spots; arms banded................ *maculata*
      d′ Tooth-papillae 6 or more, small, crowded.
        e Disk without scales, or spots; arm-spines 8, middle ones smallest; arms banded.................................... *vittata*

- *e'* Disk with scales, spotted or variegated; arm-spines 6 or 7.
  - *f* Middle arm-spines smallest, at least on base of arm.
    - *g* Arm-spines 6; upper arm-plates thin, squarish, a little wider than long; disk with more or less bright orange. . . . *hartmeyeri*
    - *g'* Arm-spines 7 or 8; upper arm-plates thick, rounded, not wider than long; no orange. . . . . *aranea*
  - *f'* Middle arm-spines not smaller than upper.
    - *g* Arm-spines 6, very slender, acute; radial shields and scales adjoining their proximal ends, white, thus forming a pair of conspicuous white streaks on disk in each radius. *polysticta*
    - *g'* Arm-spines 7, less slender, obtuse; radial shields not conspicuously white. . . . . *pantherina*

OPHIOPSILA ANNULOSA.

Ophianoplus annulosa Sars, 1857. Nyt. mag. naturvid., **10**, p. 23.
Ophiopsila annulosa Lütken, 1859. Add. ad hist. Oph., pt. 2, p. 136.

This large species (disk 11 mm. across) is known from the western Mediterranean Sea and from the southwestern coasts of Great Britain. It is perhaps the adult of *O. aranea* but nothing is as yet known of its growth-changes.

OPHIOPSILA FULVA.

Lyman, 1878. Bull. M. C. Z., **5**, p. 227.

The unique holotype of this species was taken off Havana, Cuba, in 175 fms. No authentic specimens have been collected since, so far as published records show.

OPHIOPSILA POLYACANTHA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 297.

The unique holotype of this species was taken by the SIBOGA in 33 fms. on Borneo Bank, in the Dutch East Indies.

OPHIOPSILA PAUCISPINA.

Koehler, 1907. Bull. sci., **41**, p. 314.

The only known specimen of this species is in the Paris Museum. It was taken at Fernão Veloso Bay, Mozambique.

Ophiopsila riisei.

Lütken, 1859. Add. ad hist. oph., pt. 2, p. 136.

This is a common West Indian brittle-star, occurring in crevices and holes in rocks and in similar shelters in shallow water. It has been recorded from as far north as Bermuda and as far south as Brazil, but these records need verification. At the Tortugas, *O. riisei* is common and Mr. Lyman says it is very common at Cape Florida. I have not met with it in Jamaica, nor at Tobago.

Ophiopsila maculata.

Amphipsila maculata Verrill, 1899. Bull. Univ. Iowa, new ser., **1**, no. 6, p. 55.
Ophiopsila maculata Meissner, 1901. Bronn's thierreichs, **2**, abt. 3, p. 932.

The type of this species was taken by the University of Iowa Bahamas Expedition off Havana, Cuba, in 200 fms., and in recent years, Koehler has recorded it twice. In 1908, he reports a small specimen in 36 fms. off the coast of Espiritu Santo, Brazil, and in 1914, one from southeast of Jamaica in 23 fms. and another from the vicinity of Havana, Cuba, in 201 fms. Both the geographical and bathymetrical ranges are thus rather extensive. Verrill regarded this species as one of the Ophiacanthidae but the tentacle-scales seem to make its reference to Ophiopsila imperative.

Ophiopsila vittata, sp. nov.

vittatus = banded, in reference to the coloration of the arms.

Holotype.— M. C. Z., 4,227 and 2 *Paratypes*, M. C. Z. 4,228. Florida: Dry Tortugas, southeast of Loggerhead Key, June, 1917, 6–8 fms. Carnegie Expedition. H. L. Clark coll.

Plate **8**, fig. 2.

Disk, 7 mm. in diameter; arms 75–80 mm. long. Disk covered by a smooth skin which, even when dry, shows no scales, although under a magnification of seventy diameters it appears quite rough. Radial shields long, narrow, and conspicuous; they are now in contact distally and diverge slightly proximally, but in life they are probably nearly parallel and quite separate. Upper arm-plates at base of arm tetragonal, longer than broad, with distal end not much wider than proximal and angles little rounded; they soon become wider than long with distal margin longer and more curved than proximal. They are broadly in contact throughout. Interbrachial areas below covered with a thin and perfectly naked skin. Oral shields diamond-shaped with rounded corners, as wide as long. Adoral plates long and narrow, meeting within; they are much wider at the outer end and the distal angle tends to separate the oral shield from the first side arm-plate. Oral plates very small and difficult to detect. Oral papillae 4 on a side, borne on the adoral plate; the distalmost papilla is very small and is hardly worthy of the designation; the other three are twice as long as wide, flat and pointed. Tooth-papillae 6–10, thick, pointed, rather crowded. First under arm-plate moderately large, wider than long, the distal margin longer and more convex than the proximal; succeeding plates shield-shaped, at first quite angular and longer than wide but finally becoming about as wide as long, with rounded angles; at first the distal margin is deeply concave but this soon becomes scarcely noticeable. Side arm-plates short and high; each carries 8 arm-spines, of which the lowest is much the longest; it equals nearly two segments, is slender, cylindrical, distinctly curved and rather obtuse; the next or second spine is similar but shorter; the third is very much shorter, flatter, and straighter; the fourth and fifth are like the third but a little smaller; the sixth is similar but longer and a little wider; the seventh slightly exceeds the sixth and the eighth, the seventh, in both length and width. Tentacle-scales as usual in the genus, 2, the outer small and insignificant, except on the basal joints, the inner long, flat and spine-like and lying diagonally across the lower surface of the arm. Color, in life, little altered by preservation, disk yellowish gray, the radial shields white; arms very pale yellow, banded at intervals of 2–6 segments with reddish brown rings 1 or 2 segments wide; upper arm-plates sparsely but regularly spotted along the lateral margins with minute dots of reddish brown.

The paratypes are in very poor condition, one lacking the disk and the other consisting of only two arms connected by a fragment of the disk. All three specimens were taken in a single dredge-haul on a fine, sandy bottom. Their appearance indicated that this species lives, like so many long-armed amphiurids, buried in the sand. Its habits therefore would seem to be quite different from those of *O. riisei* which is a rock- and coral-loving species. While *O. vittata* resembles *O. maculata* in its arm-spines and coloration of arms, the disk-covering and oral armature are so different the two species will not be confused.

OPHIOPSILA HARTMEYERI.

Koehler, 1913. Zool. jahrb. Suppl., **11**, p. 368.

This is a very pretty species with well-marked characters. It was taken by the BLAKE many years ago, but Mr. Lyman, apparently without carefully examining the specimens, referred them to *O. fulva* without comment. The species has been taken at stations near Florida, St. Thomas, Montserrat, Barbados, and the Abrolhos, Brazil, down to 88 fms.

OPHIOPSILA ARANEA.

Forbes, 1843. Trans. Linn. soc. London, **19**, p. 149.

Originally taken in the Aegean Sea, this species is now known from the Mediterranean, the Adriatic, and many stations in the eastern Atlantic from the Cape Verde Islands, north to the Bay of Biscay.

OPHIOPSILA POLYSTICTA.

H. L. Clark, 1915. Mem. M. C. Z., **25**, p. 298.

This is another of the species known from only one specimen. It was taken at Barbados in 7½–50 fms.

OPHIOPSILA PANTHERINA.

Koehler, 1898. Bull. sci., **31**, p. 72.

This species is known to range from the Mergui Archipelago southeastward to Banda and Timor in 4–46 fms.

OPHIODERMATIDAE.

OPHIURODON CUPIDA.

Ophioconis cupida Koehler, 1905. SIBOGA-exp. Oph. litt., p. 15, pl. 1, fig. 19, 20.
Ophiurodon cupida Matsumoto, 1915. Proc. Acad. nat. sci. Phila., **67**, p. 84.

Among the brittle-stars collected at Port Galera, Mindoro, P. I., in the spring of 1912, by Dr. L. E. Griffin, there is an Ophiurodon which must be referred to this species, though it differs somewhat from Koehler's specimens from Ubian, Sulu, and Damar in the East Indies. The disk is nearly 5 mm. across, but the arms, now broken at the tip, could not have been much more than 12 mm. Koehler gives the arms as 15 mm. long, in a specimen with the disk 4 mm. in diameter. There are 3 tentacle-scales on the first, and sometimes on the second pore, of each arm, and beyond that there are two scales to the end of the arm. In Koehler's specimens, there were 2 tentacle-scales, only on the basal part of the arm. The fine striations on the arm-plates to which Koehler refers are not very well-marked in the present specimen. Finally, Koehler says nothing about color, while the specimen at hand has a very distinct coloration; the disk and the whole lower surface are yellowish white, while the arms are banded with grayish brown and dirty white.

OPHIODERMA PHOENIUM.

φοίνιος = blood-red, in reference to the color of the disk.

Plate 6, fig. 1, 2.

Holotype.— M. C. Z. 4,165 and 50 *Paratypes*, M. C. Z. 4,166, 4,207. British West Indies: Tobago, Buccoo Reef, April, 1916. Carnegie Expedition. H. L. Clark coll.

Disk, 20 mm. in diameter; arms 70–80 mm. long. Disk covered with a uniform coat of granules, about 50 to a square millimeter. Radial shields very small, more than a millimeter long, less than a millimeter wide and over three millimeters apart; two are entirely concealed by the granules and one other is partially covered. At the side of the base of each arm is a considerable area of overlapping scales extending out from the disk as far as the eighth or ninth arm-segment (second or third beyond disk-margin) and running back orally to the third segment. Upper arm-plates quadrilateral with the outer corners much rounded; they are 3–4 times as broad as long, are very rarely broken or cracked as in *O. cinereum* and some other Ophiodermas, and are in contact for their full width. Interbrachial areas below covered by granules like those of disk. Genital slits 4 in each area, very small, widely separated; distal pair much the larger and exceeding an arm-segment in length. Oral shields triangular with rounded angles, rather wider than long. Adoral and oral plates completely concealed beneath a uniform coat of granules like those of disk. Oral papillae about 10 on a side the penultimate (distally) distinctly the largest. First under arm-plate, small, somewhat triangular, wider than long; second plate tetragonal or somewhat pentagonal. longer than wide, distal corners rounded; succeeding plates tetragonal or slightly hexagonal, about as wide as long, distal corners much rounded; far out on arm, the plates become distinctly longer than wide; they are broadly in contact throughout. Side arm-plates low and small, confined to sides of arm; each carries a series of 9 (rarely 10), flat, blunt arm-spines, closely appressed to arm; the lowest is bluntest and longest but is not equal to the arm-segment; the others are successively shorter and less blunt to the uppermost which is bluntly pointed and scarcely half as long as the segment. Tentacle-scales 2, the outer short, wide, truncate, and overlapping the base of the lowest arm-spine; the inner longer, narrower, and rounded at tip. Color, in life, disk deep red above and below; arms, above deep green, below pale reddish proximally but becoming pale greenish distally; arm-spines, reddish or dull orange with conspicuously lighter tips.

The above description is that of a typical specimen but there is much individual diversity in certain particulars. The smallest specimen found has the disk 15 mm. across; in the largest it is 23 mm. In the smallest specimen and in most of the others all of the radial shields are bare and of approximately equal size, but in several specimens, one or more of the shields are concealed by the granules; in a specimen 16 mm. across the disk, only one radial shield is visible. The number of arm-spines is surprisingly constant; not one case of eleven spines has been seen and in no specimen does the number fall short of nine; but there is much diversity in the size and shape of the spines, for they are often shorter, thicker, and more pointed than in the holotype, while occasionally they are slightly longer. The most notable diversity shown by this series of specimens is in color. The majority have the characteristic red disk and green arms, with light-tipped arm-spines, but at one extreme is a specimen almost uniformly green (seen from above) while at the other is a red specimen that shows no trace of green. The typical specimens had the red of the disk, in life, what Ridgway (1912) calls nopal red (midway between no. 26 and 27 of Klincksieck and Valette, 1908), while the arms ranged from Ridgway's dark citrine (K. & V. 179–180) through spinach-green (K. & V. 304–305) to bright meadow-green (K. & V. 326–327). In some specimens with otherwise wholly red disks, the oral shields are dusky greenish, but in *all* the specimens seen, the jaw-angles proximal to the oral shields are red. Rarely the terminal half of the arms shows indications of three or four transverse dusky bands; these are most evident in the wholly green specimen. In the wholly red specimen, the disk and arms are of nearly the same shade, a rosier red than usual and the arms are slightly blotched and are tipped with reddish white. Preserved specimens, whether alcoholic or dry hold their colors fairly well, but of course they are duller than in life; the greens seem to change more than the reds.

This is a very handsome and noteworthy species, quite different from any of its West Indian congeners. In many structural features, it resembles *O. panamensis* but aside from the striking and important color-differences, the granulation of the disk is very much coarser and the arms are shorter and stouter. It occurs commonly on those parts of Buccoo Reef which are accessible only at the lowest tides, its usual companions being *Ophioderma cinereum, O. guttatum*, and *Ophiomyxa flaccida*. It was only found elsewhere on two or three occasions.

OPHIODERMA SQUAMOSISSIMUM.

Lütken, 1856. Vid. med., p. 8. 1859. Add. ad hist. Oph., pt. 2, pl. 1, fig. 7*a*, 7*b*.

Plate **4**, fig. 1; Plate **6**, fig. 3, 4.

That this superb ophiuran is one of the handsomest and most brilliantly colored of marine animals will not be questioned by any one who sees it alive. Hitherto known only from the type at Copenhagen, from an unknown locality in the West Indies, its discovery at Tobago was one of the notable features of our stay there. We found it only on that part of Buccoo Reef, which was accessible at the lowest tides, and even there it was very rare; only five specimens were seen and on only one day were two specimens secured. These are all smaller than the holotype and range from 17 to 22 mm. in disk-diameter. They agreed exactly in color, which was a brilliant red, about the shade designated as scarlet by Ridgway (1912), or very near Klincksieck's and Valette's no. 76. The disk was slightly marked with a somewhat yellower shade. Unfortunately the color bleaches very rapidly and completely in alcohol (the holotype is recorded as having the color "entirely bleached out") but it is apparently not affected by formalin. Specimens treated with formalin and corrosive sublimate, and then dried, retained the color well for several months but at the end of a year have faded very much. Lütken's description and figures fit these Tobagoan specimens admirably but Dr. Mortensen has kindly compared one of them with Lütken's type and assures me there is no doubt of their identity. The remarkable fragmentation of the upper arm-plates in this species and *O. guttatum* should probably be considered a generic character, especially as it is associated with a peculiar type of disk-granulation.

OPHIOCRYPTUS DUBIUS, sp. nov.

dubius = doubtful, in reference to the uncertainty of its status.

Plate 3, fig. 4, 5.

Holotype.— M. C. Z. 4,171. British West Indies: Tobago, Buccoo Bay, April, 1916, under a stone in very shallow water. Carnegie Expedition. H. L. Clark coll.

Disk, 4.5 mm. in diameter; arms, about 12 mm. long. Disk covered by a very close coat of fine granules which not only conceals the radial shields and covers the interbrachial areas below, but extends over all the plates of the arms, clear to the tip, completely concealing them, and over all the plates of the oral frame too, except the center of the madreporite. Genital slits 4 in each interbrachial area, small. Oral papillae about 9 on each side, the two distalmost flattest and largest, the most distal extending inwards above the second. Arm-spines 5 (4 distally), very small, thick, almost conical, pointed, well-spaced, not appressed. Tentacle-scales 2, relatively large, the outer *not* overlapping the base of the lowest arm-spine. Color, in life, pale grayish above, nearly white beneath; upper surface of arms with faint indications of two or three dusky, transverse bands.

This specimen raises anew the whole question of the relationship of Ophioncus and Ophiocryptus to Ophioderma. Are they based simply on very young specimens of that genus or are they really valid genera? This problem will be solved only when much more material is available. The type of Ophioncus is unique and each of the species of Ophiocryptus is based on a single specimen. At Tobago, I secured many young *Ophioderma appressum*, with the disks less than 5 mm. in diameter; there is no doubt as to their generic position. On the other hand, I have had the opportunity, through the kindness of Mr. A. H. Clark and the authorities of the U. S. National Museum, of examining the brittle-star which Koehler, (1914. Bull. 84 U. S. N. M.,

p. 8, pl. 2, fig. 1, 2) described as a young Ophioderma and which I, without seeing it, named *Ophiocryptus hexacanthus* (1915. Journ. ent. zool., **7**, p. 64). Comparison with the smallest specimens of *Ophioderma cinereum* in the M. C. Z. shows that Koehler was right and the specimen is a young Ophioderma, and probably *O. cinereum*. Although it and my Tobagoan specimen are of the same size, they differ in so many points that they are probably not identical. It seems better to describe and figure this specimen and give it a name, than to let it sink out of sight in literature under the name Ophioderma. It is quite possible that it will ultimately be shown that *O. dubius* is a young Ophioderma, and that the same is true of *O. maculatus* and Ophioncus, but the truth will be more speedily reached if the distinctive names are retained.

OPHIOLEPIDIDAE.

Ophioplocus bispinosus, sp. nov.

bispinosus = having two spines, in reference to the number of arm-spines.

Plate **4**, fig. 2.

Holotype.— M. C. Z. 4,025 and 6 *Paratypes*, M. C. Z. 4,054, 4,211. Victoria: Philip Island, Westernport, May, 1915. Joseph Gabriel coll.

Disk, 9 mm. in diameter; arms about 25 mm. long. Disk very flat, slightly lobed in the interradii, covered by a coat of small, more or less swollen scales, about 7 or 8 series in each interradial area; no primary plates are visible but at the margin, in each interradius, is a conspicuous, slightly projecting plate, much larger than any other disk-plate and more than twice as wide as long (or high). Radial shields small (no larger than some disk-plates), widely separated, slightly sunken. Outside radial shields and extending on to the base of the arm are a number of small, swollen plates. Arm-segments covered dorsally by a set of six plates, of which the three distal are much larger than the three proximal; of the distal three, the lateral are largest and (judging from conditions at tip of arm) represent the two halves of the original upper arm-plate; of the three proximal plates, the median is largest; not infrequently, by what seems to be fusion, the proximal series consists of but two plates or even one;

occasionally, by what appears to be splitting, or by intercalation there are 7 or even 8 plates, on a segment instead of six. Interbrachial areas below covered by a pavement of closely set, small thick plates. Genital slits, 2 in each area, very small, starting close to oral shield and not exceeding the first arm-segment, bordered abradially by 4–6 small but noticeable papillae. Oral shields moderate, distinctly wider than long, somewhat triangular, except the madreporite which is larger and more tetragonal. Adoral plates straight and narrow, 3 or 4 times as long as wide, fully meeting within. Oral plates small and indistinct. Oral papillae, 5 on a side and one at apex of jaw; penultimate largest, flat and wide. First under arm-plate, small, diamond-shaped, wider than long; succeeding plates, pentagonal, almost or quite as long as wide, little or not at all in contact, distal margin a little convex, adjoining lateral margins concave. Side arm-plates small, but meeting below except near disk; each carries 2 short, thick, bluntly pointed arm-spines, of which the lower is the longer but does not equal a segment. Tentacle-scales single, rather large, bluntly pointed. Color, dry, pale olive-gray above, the arms very faintly and irregularly banded; beneath uniformly light buff.

This species is obviously different from any other species of the genus except *O. huttoni* of New Zealand, and Farquhar's excellent figures make it possible to compare it closely with that nearly allied species. I have decided that the two must be different because of the number and arrangement of the upper arm-plates. All three of the Australian specimens, though they range in disk-diameter from 5 to 10 mm., agree in the fundamental plan, already described by which these plates are arranged. In *O. huttoni*, however, there are 9 or 10 plates on each segment, including a distal series of three or four plates which is lacking in the Australian specimens. I am inclined to lay considerable stress on this because comparison of specimens of the other three species, shows that there is for each member of the genus a characteristic plan. In *O. esmarki*, it is similar to that of *O. bispinosus* but the proportions of the plates are different. In *O. imbricatus* the number of plates on a segment rises to a dozen or more, while in *O. japonicus* there may be fifteen or even seventeen. The scaling of the disk is different in *O. bispinosus* from what it is in *O. huttoni* as there is no regular arrangement of smaller plates around larger ones. Under the circumstances, the Australian Ophioplocus may be considered distinct from that of New Zealand until direct comparison proves them to be the same.

EXPLANATION OF THE PLATES.

PLATE 1.

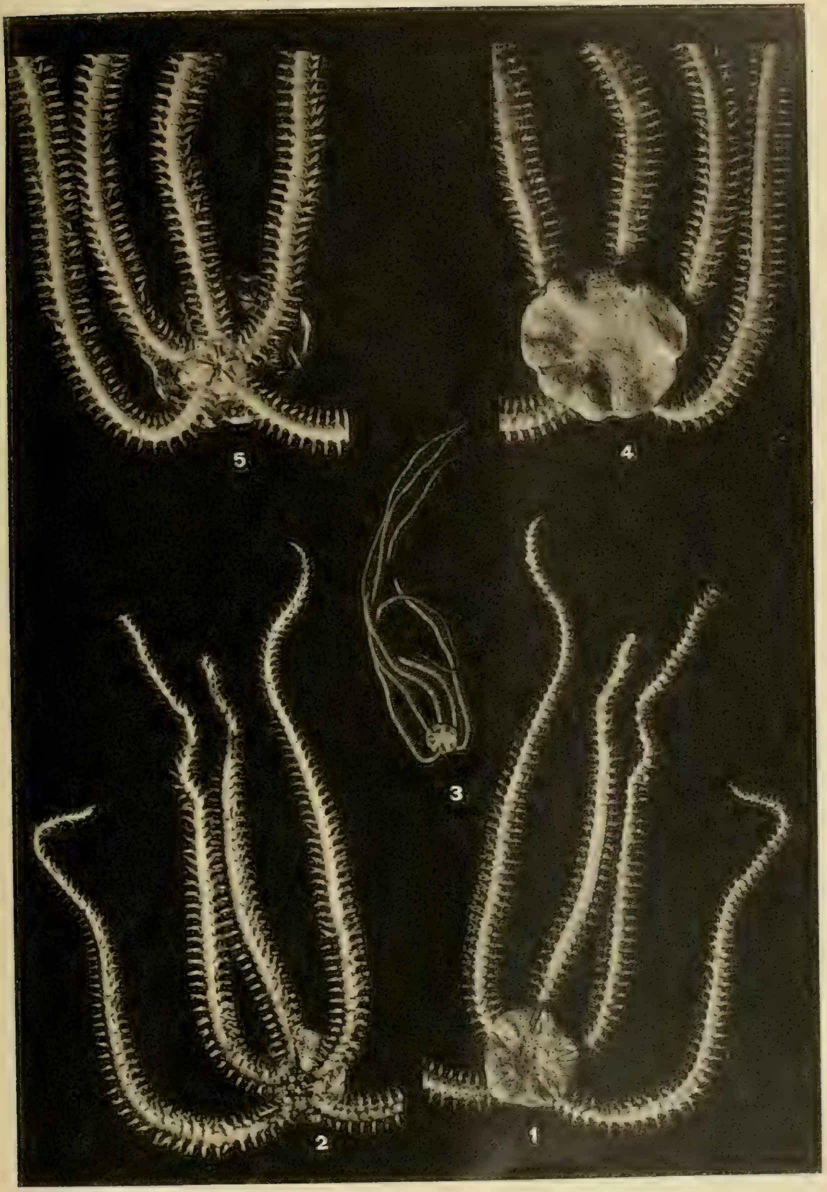
PLATE 1.

Amphiura vivipara H. L. Clark. Holotype. Tobago.

Fig. 1. Aboral view. × 4.
Fig. 2. Oral view.

Amphipholis pachybactra H. L. Clark. Holotype. Tobago.

Fig. 3. Aboral view. Three fourths nat. size.
Fig. 4. Aboral view of disk and bases of arms. × 3.5.
Fig. 5. Oral view.



HELIOTYPE CO. BOSTON

PLATE 2.

PLATE 2.

Ophionema intricata Lütken. Tobago.

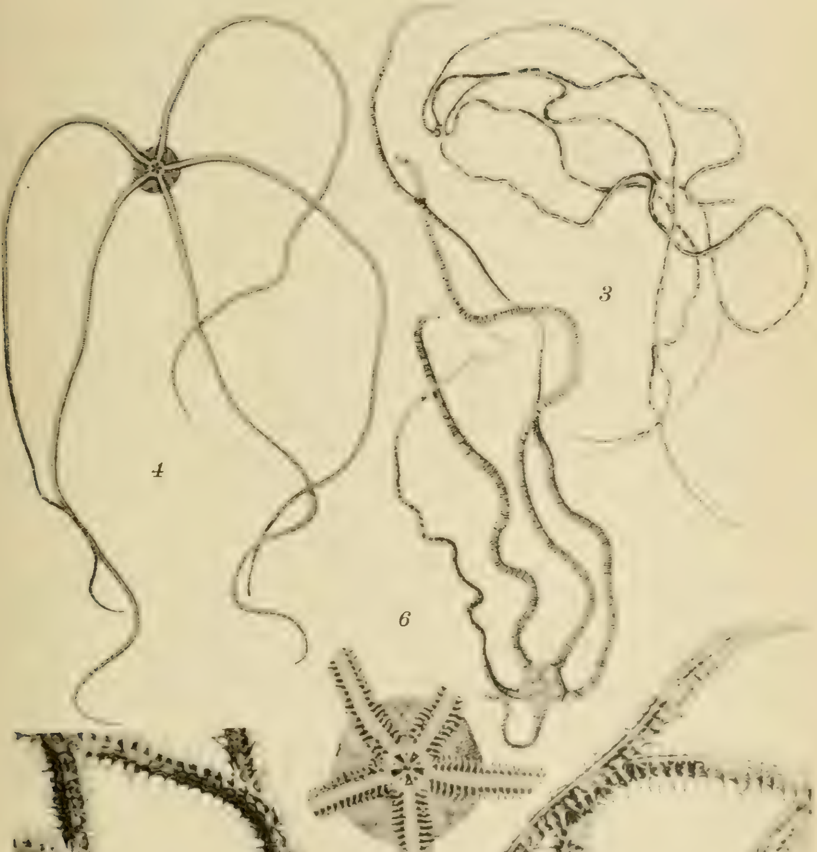
Fig. 1. Aboral view of diskless body and bases of arms. × 4.
Fig. 2. Oral view.
Fig. 3. Aboral view of diskless specimen. Nat. size.

Ophiophragmus filograneus (Lym.). Fla.: Port Tampa.

Fig. 4. Oral view. Nat. size.
Fig. 5. Oral view of disk and bases of arms. × 3.

Amphiodia tymbara H. L. Clark. Holotype. Tobago.

Fig. 6. Aboral view. Three fourths nat. size.



HELIOTYPE CO. BOSTON

PLATE 3.

PLATE 3.

Amphiodia trychna H. L. Clark. Holotype. Tobago.

Fig. 1. Aboral view of disk and bases of arms. × 4.
Fig. 2. Oral view.
Fig. 3. Aboral view of entire specimen. Two thirds nat. size.

Ophiocryptus dubius H. L. Clark. Holotype. Tobago.

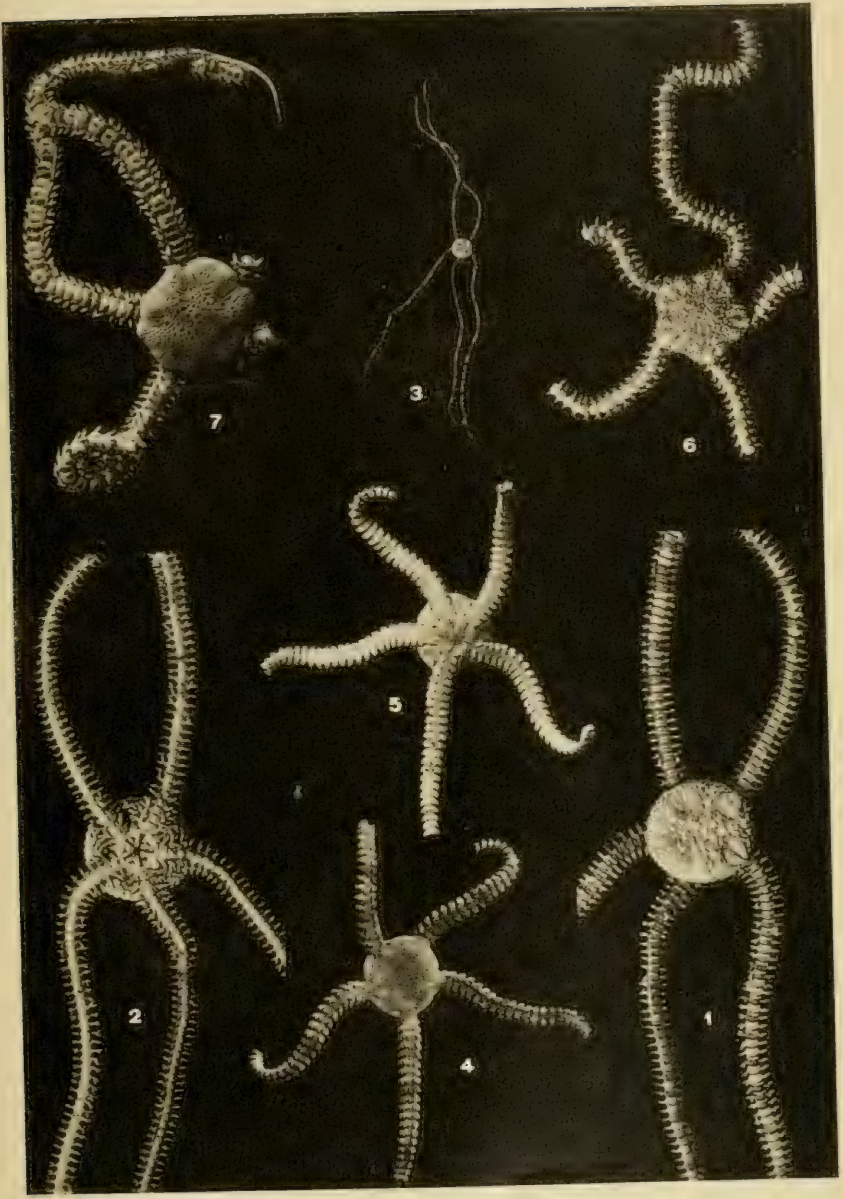
Fig. 4. Aboral view. × 2.
Fig. 5. Oral view.

Ophiostigma rugosum H. L. Clark. Holotype. Philippine Islands.

Fig. 6. Aboral view. × 2.5.

Amphiodia mesopoma H. L. Clark. Victoria: Westernport.

Fig. 7. Aboral view. × 3.



HELIOTYPE CO. BOSTON

PLATE 4.

PLATE 4.

Ophioderma squamosissimum Lütken. Tobago.

Fig. 1. Bit of disk and base of one arm. × 4.

Ophioplocus bispinosus H. L. Clark. Holotype. Victoria: Westernport.

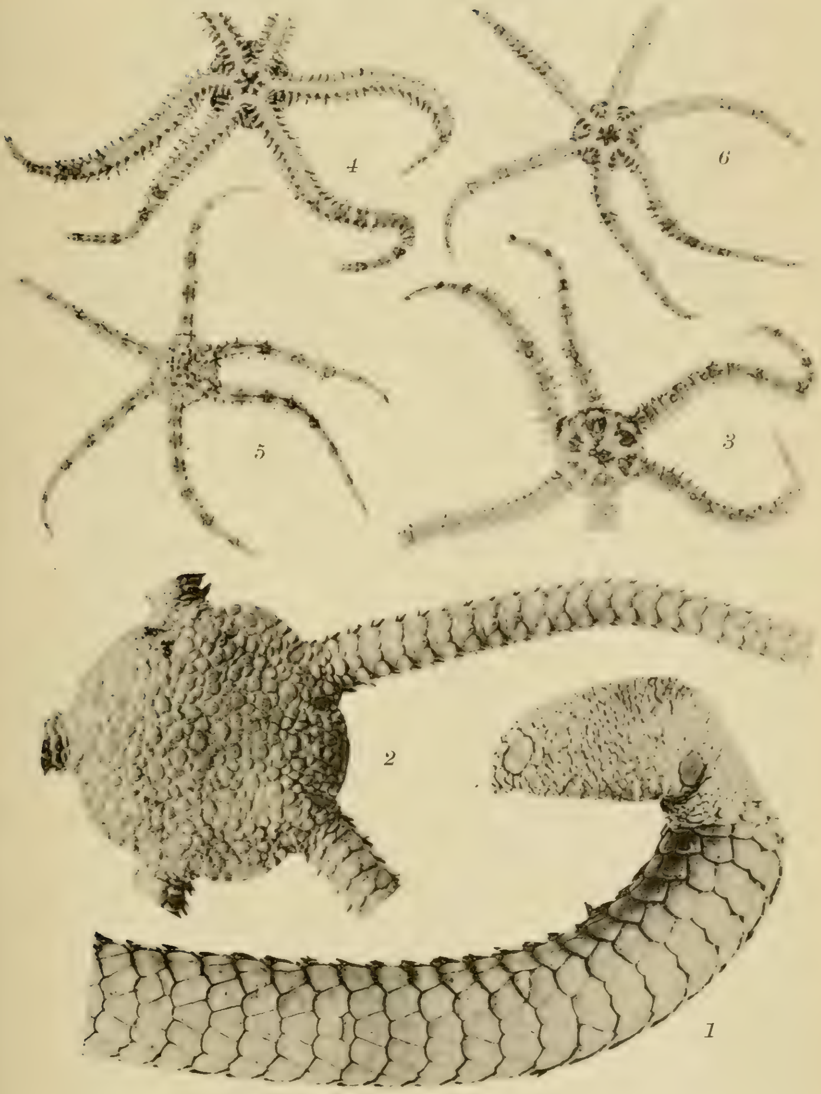
Fig. 2. Aboral view of disk and basal half of one arm. × 4.

Ophiactis cyanosticta H. L. Clark. Holotype. Tobago.

Fig. 3. Aboral view. × 4.
Fig. 4. Oral view.

Ophiactis lymani Ljungman. Tobago.

Fig. 5. Aboral view. × 4.
Fig. 6. Oral view.



HELIOTYPE CO. BOSTON

PLATE 5.

PLATE 5.

Ophiothrix dirrhabdota H. L. Clark. Holotype. Philippine Islands.

Fig. 1. Aboral view. × 2.5.

Ophiothrix leucotrigona H. L. Clark. Holotype. Philippine Islands.

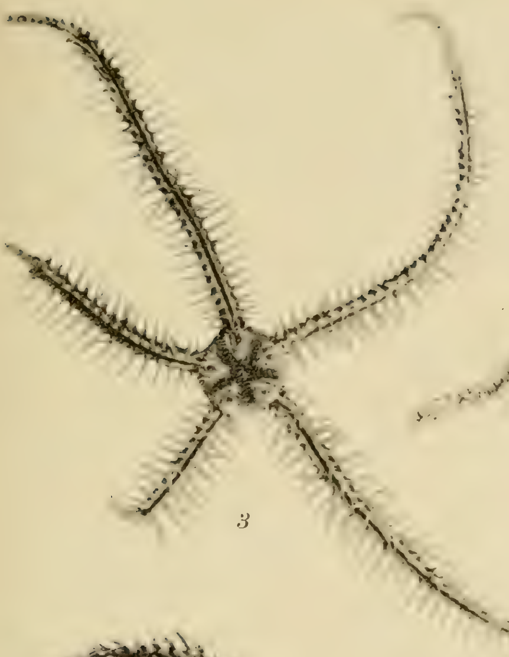
Fig. 2. Aboral view. × 3.3.

Ophiothrix angulata var. *atrolineata* H. L. Clark. Holotype. Tobago.

Fig. 3. Aboral view. × 4.

Ophiothrix eurycolpodes H. L. Clark. Holotype. Philippine Islands.

Fig. 4. Aboral view. × 2.5.



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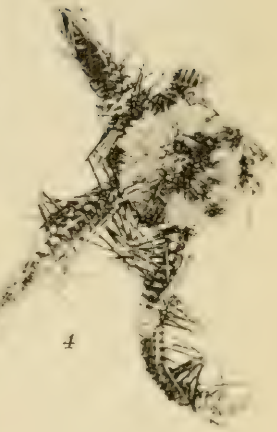

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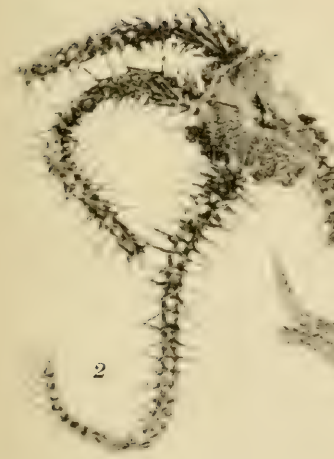

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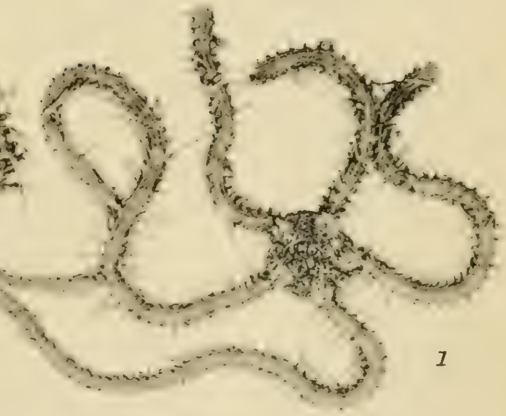

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HELIOTYPE CO. BOSTON

PLATE 6.

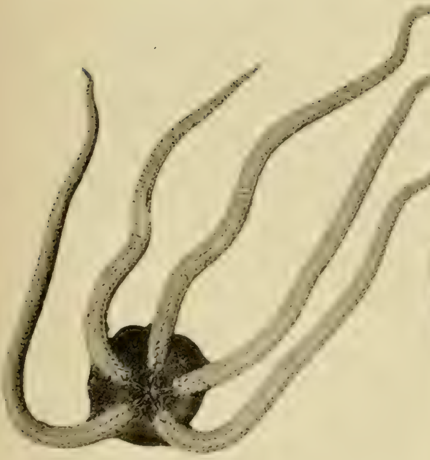
PLATE 6.

Ophioderma phoenium H. L. Clark. Holotype. Tobago.

Fig. 1. Aboral view. Nat. size.
Fig. 2. Oral view.

Ophioderma squamosissimum Lütken. Tobago.

Fig. 3. Aboral view. Nat. size.
Fig. 4. Oral view.



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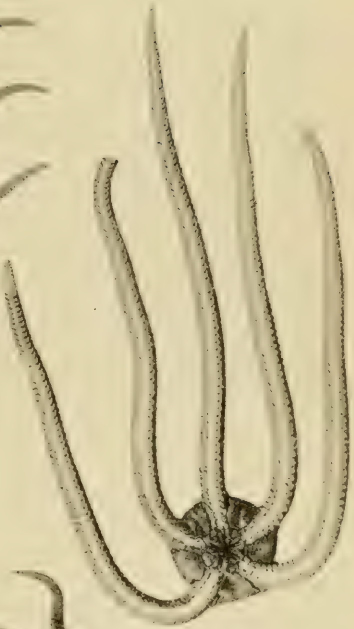

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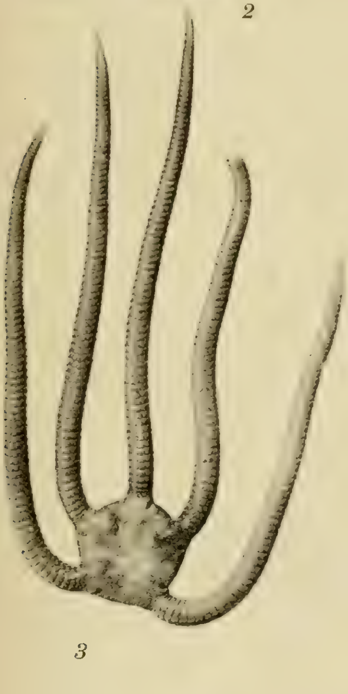

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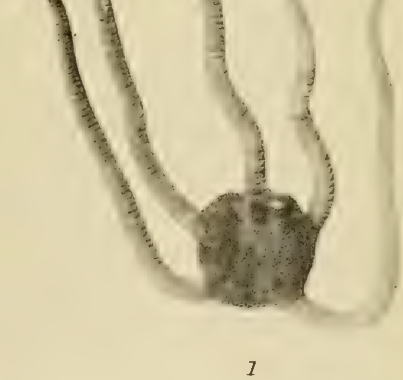

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HELIOTYPE CO. BOSTON

PLATE 7.

PLATE **7**.

Amphioplus thrombodes H. L. Clark. Holotype. Key West.

Fig. 1. Aboral view. Nat. size.
Fig. 2. Aboral view of disk and bases of arms. × 3.

Amphioplus coniortodes H. L. Clark. Holotype. Key West.

Fig. 3. Aboral view. Nat. size.
Fig. 4. Aboral view of disk and bases of arms. × 3.

Ophiacantha oligacantha H. L. Clark. Holotype. Tortugas.

Fig. 5. Aboral view. × 3.

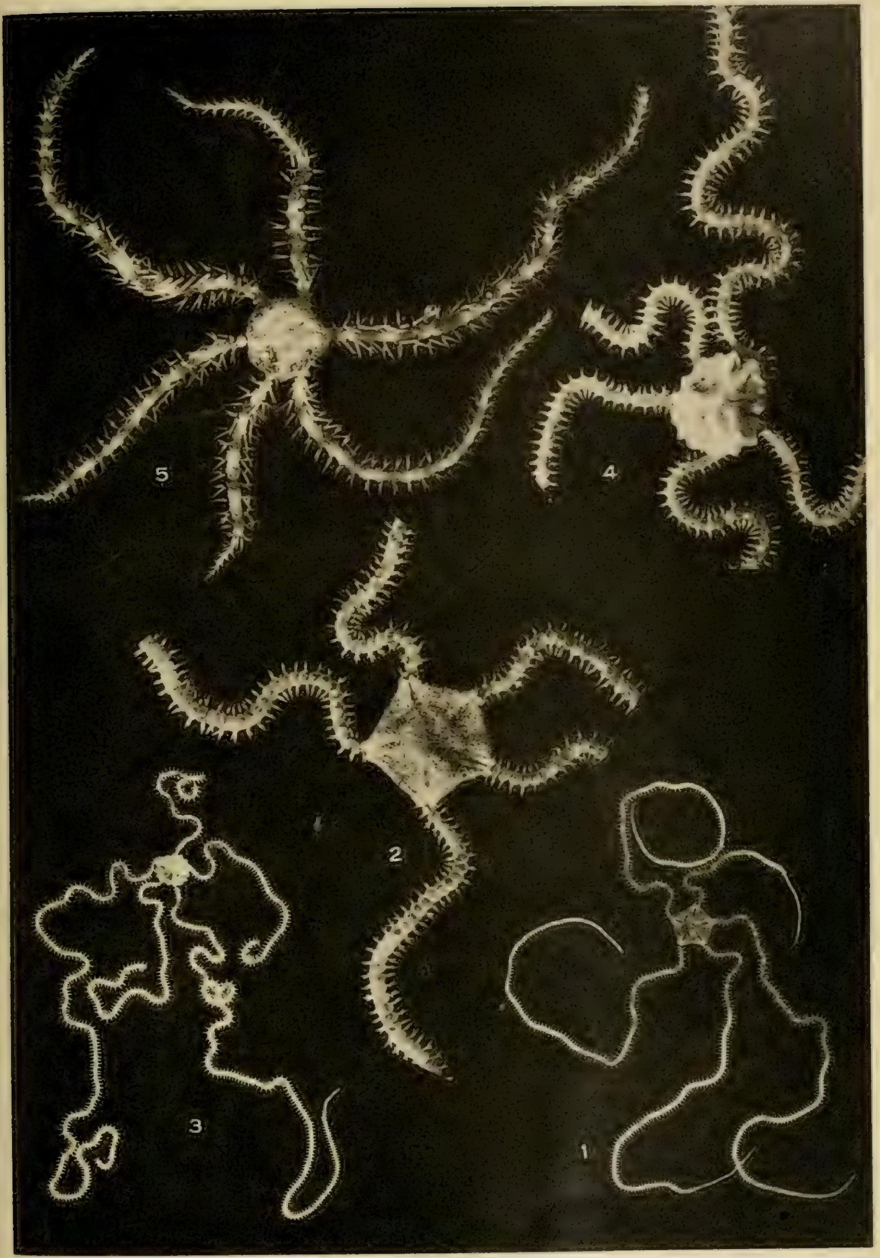
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PLATE 8.

PLATE 8.

Ophiophragmus pulcher H. L. Clark. Holotype. Tortugas.

Fig. 1. Aboral view. × 1.5.

Ophiopsila vittata H. L. Clark. Holotype. Tortugas.

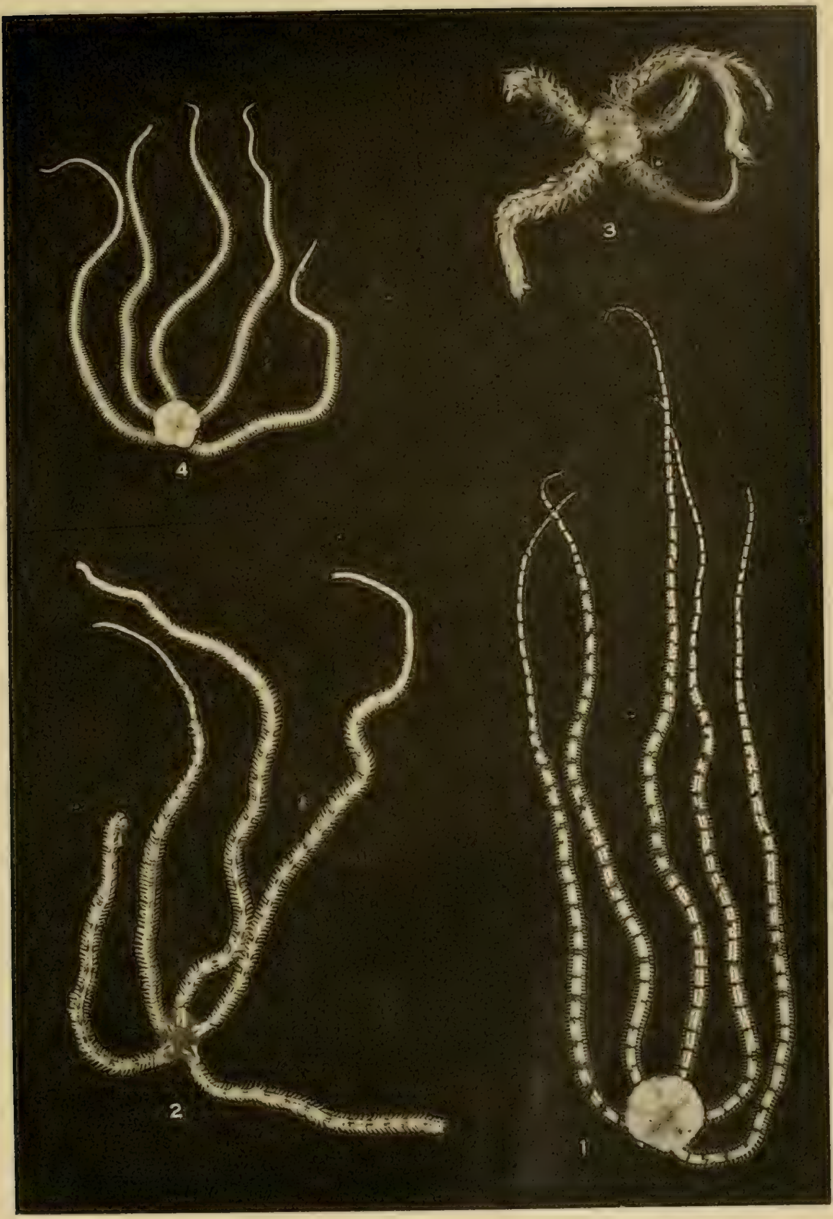
Fig. 2. Aboral view. Nat. size.

Ophiothrix angulata var. *megalaspis* H. L. Clark. Holotype. Gulf of Mexico.

Fig. 3. Aboral view. Nat. size.

Amphiodia rhabdota H. L. Clark. Holotype. Tortugas.

Fig. 4. Aboral view. Nat. size.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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXII. No. 7.

THE ANTS OF THE GENUS OPISTHOPSIS EMERY.

By William Morton Wheeler.

With Three Plates.

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM.
November, 1918.

No. 7.— *The Ants of the Genus Opisthopsis Emery.*

By William Morton Wheeler.

CONTRIBUTIONS FROM THE ENTOMOLOGICAL LABORATORY OF THE BUSSEY INSTITUTION, HARVARD UNIVERSITY, No. 142.

The species of the singular Camponotine genus Opisthopsis are confined to the Australian and Papuan regions and are readily distinguished from other ants by their usually striking coloration and very large and prominent eyes, situated at the posterior corners of the head. The first, or type-species was described in 1864 by Frederick Smith, under the name *Formica* (*Myrmecopsis*) *respiciens* from New Guinea. As Guérin had given the name Myrmicopsis in 1830 to a genus of Mutillidae Emery in 1893 saw fit to change that of the ant-genus to Opisthopsis. This was hardly justified by the rules of nomenclature, because Smith's and Guérin's names differed by a letter. Forel, however, discovered that Myrmecopsis had been used by Newman as early as 1850 for a genus of Lepidoptera, so that Emery's name became valid.

Our knowledge of the species of Opisthopsis has grown very slowly. Up to the present time five species and a subspecies have been added to the genus by Emery and Forel. The material on which these were based seems to have been rather meager. Several of the described forms were evidently known to Mayr in 1876 but he regarded them merely as color varieties of the typical *respiciens*. Emery and Forel, however, believe that these color forms are relatively constant and therefore regard them as distinct species. While in Australia during the winter of 1914 to 1915 I collected a considerable number of Opisthopsis and have since received a series of specimens from the Museum of South Australia and a species collected in the British Solomon Islands by Dr. W. M. Mann. A study of this material, comprising, in addition to all but one of the previously known forms, five undescribed species and as many varieties, shows that the genus is very homogeneous. The various forms differ from one another by slight peculiarities in the structure of the head and thorax, sculpture and pilosity, correlated with more conspicuous differences in coloration. A consistent "lumper" would probably regard all the forms as merely so many varieties or subspecies of a single variable species, but as the color differences are constant within certain easily discernible limits, I follow the example of Emery and Forel and recognize eleven species. Two of these, *pictus* Emery and *rufithorax* Emery, should probably be united, as the former is unusually variable in color and has one variety that is transitional to *rufithorax*. I may add that although I have examined more specimens of Opisthopsis than any previous worker, the final decision as to the limits of the species, subspecies, and varieties must be left to the resident Australian entomologist who can make an intensive study of the geographical distribution of the group. My account of these insects will, I trust, show that both their habits and taxonomy merit closer investigation.

The genus Opisthopsis is evidently very largely confined to Australia, as only one species (*O. linnaei*) is known from the Bismarck Archipelago, one (*O. respiciens*) from New Guinea and one (*O. manni*) from the Solomon Islands. *Opisthopsis respiciens*, moreover, is common also in Northern Australia and *O. haddoni* may occur in New Guinea. The precise ranges of the various Australian species cannot be given at the present time. Forel's statement that *O. respiciens* is "in ganz Australien verbreitet," is, I am sure, erroneous. I failed to find any Opisthopsis in Eastern Australia south of Brisbane, Queensland (27° 30′ S.), and with the exception of some specimens of *O. rufithorax*, I have seen none taken in a more southern latitude. Froggatt does indeed record *O. respiciens* from New South Wales and Mayr cites it from Sydney, but Froggatt's specimens may have been collected near the Queensland border and Mayr's may have been specimens of *rufithorax*. All the species I have seen in the field were living at low elevations in the dense "scrub" (tropical rain forest) or dry, open "forest" of Queensland. *Opisthopsis respiciens* seems to prefer the former, the paler, yellow species (*haddoni, major, jocosus, rufithorax*, etc.) the latter situations.

The workers are usually seen running in the bright sun-light up and down the trunks of large trees, especially of the genera Eucalyptus and Melaleuca, with rapid, jerky movements like those of our large-eyed, neotropical Pseudomyrmas. They have extremely acute vision, as would be inferred from the large size, very fine facetting and peculiar position of the eyes, and are therefore very difficult to catch, as they look backward as well as sidewise and forward and dodge about with such adroit zigzag movements that it is almost impossible to seize them with the tweezers or fingers. I finally resorted with greater success to slapping them with the hand, but this is apt to crush them or to make them fall from perpendicular surfaces.

The interesting resemblance of these ants to the large-eyed, arboreal and bright-colored species of Pseudomyrma in the Neotropical and of Sima in the Palaeotropical region led me to look for their nests in the trees, but I failed in this quest and concluded that the nests must be at inaccessible heights in the trunks or branches. Through a fortunate accident, however, at Koah, near Kuranda, Queensland, I discovered the nests of one species, *O. haddoni*. In this arid forest region there are innumerable termite nests of all sizes from a foot or two to six or seven feet in height. I found that the smaller nests could be easily broken off at the base and turned over by a sharp kick with the foot. This exposed the galleries in the base of the termitarium and to my surprise I found them in nearly every nest inhabited by a colony of the beautiful orange and black *haddoni*. Such study as I could make in the field showed that the ants take possession of the galleries by replacing the termites, which retreat to the upper portion of the nest-cone. Perhaps the ants feed very largely on the soft-bodied termites, although the latter were not molested when they happened to creep into galleries inhabited by the ants. From this and the further fact that I found *haddoni* nesting by itself under stones only on one occasion, I infer that this ant is regularly termitophilous. Later I again found *haddoni* nesting in precisely the same manner in termitaria near Townsville, Queensland.

On my return to the United States I learned that Dr. E. Mjöberg (in Forel, Ark. f. zool., 1915, **9**, p. 95) had recently made similar observations on *O. haddoni* in the Kimberley District of North West Australia and at Laura, Cape York and Colosseum, Queensland. He also succeeded in finding the nests of *O. rufithorax* "in clay about the roots of trees." Nevertheless this terrestrial method of nesting is by no means universal in the genus. Dahl discovered the nests of *O. linnæi* in tree-trunks in the Bismarck Archipelago, and Mann recently found a nest of *O. manni* in a similar situation in the Solomon Islands. In all probability *O. respiciens* will be found to have similar habits.

The colonies of *O. haddoni* are rather small, comprising only about 100 to 200 workers with a single or several deälated queens. The larvae are white and plump and covered with short, simple hairs. They spin pale buff-colored cocoons like most Camponotinae. It is easy to capture the ants in their nest as they seem to be dazed when the termitarium is suddenly broken in two and the light let into their galleries. In this connection I may state that numerous other ants are quite as regularly found nesting in termitaria at Koah and Townsville, Queensland. In both localities the very pugnacious *Iridomyr-*

mex sanguineus was found only in termitaria, usually in the upper portions, but often throughout the structure. At Koah I found also three species of *Polyrhachis* of the subgenus *Chariomyrma* (*cyrus, senilis,* and *comata*) and *Camponotus* (*Myrmogonia*) *rubiginosus* in the smaller termite nests, the former frequently, the latter as a regular inquiline. It builds on the surface of the termitarium a small, chimney-like entrance, which is guarded by one of the large-headed major workers. *Euponera* (*Brachyponera*) *lutea* and two forms of *Camponotus* (*Myrmoturba*) *maculatus* are also occasionally found in termitaria but nest much more frequently under stones and logs.

Not only is *O. haddoni* a regular inquiline in the nests of another insect, but it seems to be itself the host of other species of Opisthopsis! In several of the nests at Koah I found from one to six very dark brown or black workers among the bright yellow *haddoni.* In my opinion they belong to two distinct species, which are described below as *O. maurus* and *lienosus.* The fact that they occurred in *haddoni* colonies in which males and females were hatching, would seem to be fatal to the view that they are true parasites. That they are very aberrant or diseased workers of *haddoni* seems to me improbable, because the workers of this species are very constant in coloration and because the dark individuals exhibit peculiarities of form and sculpture as well as of color. I believe that *haddoni,* like many other ants, may occasionally kidnap the brood of alien species and that the dark individuals may have been reared from cocoons thus procured.

The males of Opisthopsis seem not to have been seen by previous observers and the females of only a few of the species have been described. The males are of the same size as the workers and very much like the males of Camponotus, with which genus Opisthopsis is evidently very closely related. Forel, in a recent classification of the subfamily Camponotinae, places Opisthopsis in the tribe Camponotini and shows that its proventriculus ("gizzard") has essentially the same structure as in Camponotus, being long and slender, with a straight, *i. e.* nonreflected calyx (Plate 3, fig. 29). Opisthopsis cannot, however, be regarded as an offshoot of the genus Camponotus, owing to the fact that the former has a discal cell in the fore wing. This represents a more primitive condition than in Camponotus, where the discal cell is always absent. We must conclude, therefore, that both Opisthopsis and Camponotus have had a common origin from some more ancient, extinct genus with a venation more like that of Formica. Attentive examination of the workers of Opisthopsis shows that they have a feeble tendency to dimorphism in the shape of the head, the larger individuals having the region in front of the eyes more convex on the sides than the smaller individuals. In one speclos (*O. jocosus*) the dimorphism is very distinct.

In the figures accompanying this article I have endeavored to indicate the extent of the black or dark brown markings by stippling. The color of the eyes is peculiar. The retinal pigments are either very unstable and fugitive, so that they disappear in alcohol, or the eyes are in many of the species of an unusual pale gray or whitish color in life. Unfortunately I failed to note the eye-color in living individuals. In the descriptions I have recorded it as it appears in the dried specimens.

OPISTHOPSIS Emery.

Worker. Small, monomorphic or slightly dimorphic; thorax, petiole, and gaster resembling the corresponding parts in Camponotus. Anterior femora incrassated. Head elongate, subtrapezoidal, with long, straight or more or less convex or inflated cheeks. Eyes very large, prominent, elliptical and finely facetted, at the posterior corners of the head. Ocelli usually absent, the anterior ocellus sometimes present. Mandibles small, triangular, 5-toothed. Maxillary palpi 6-jointed, labial palpi 4-jointed. Clypeus well-developed, more or less carinate or subcarinate, its anterior border entire, projecting over the base of the mandibles as a broad, rather rounded lobe. Antennae 12-jointed, inserted at the sides of the frontal carinae some distance behind the posterior clypeal suture, so that the antennal and clypeal fossae are distinctly separated. Antennal funiculi nonclavate, all the joints distinctly longer than broad. Frontal area large, indistinct, subtriangular or trapezoidal; frontal carinae moderately long, rather far apart, diverging posteriorly. Epinotum unarmed, more or less angular. Petiolar scale thin and anteroposteriorly compressed. Proventriculus long and slender, the calyx straight, with nonreflected sepals. Body smooth, more or less shining, finely shagreened. Pilosity and pubescence feebly developed.

Female. Larger than the worker, with broader head and usually 6-toothed mandibles. Eyes and ocelli well-developed, the former much as in the worker. Thorax, petiole, and gaster as in Camponotus, the thorax elongate elliptical, the petiole anteroposteriorly compressed. Wings also similar but with small but distinct, triangular discal cell.

Male. Not larger than the worker, very similar to the male of Camponotus. Maxillary palpi 6-jointed, labial palpi 4-jointed. Mandibles well-developed, pointed, usually edentate. Eyes and ocelli large, the former nearly half as long as the head; cheeks long and straight. Antennae 13-jointed, scapes fully $\frac{2}{3}$ as long as the funiculi; first joint of the latter cylindrical, scarcely longer but distinctly thicker than the second. Thorax, petiole, and gaster much as in Camponotus; the external genitalia also very similar, their valves slender and exserted. Wings with the discal cell very small and triangular, sometimes wanting.

Table for the identification of the workers.

1. Head largely black or dark brown........................2
Head entirely yellow or with only the vertex and occiput black.10
2. Thorax black or dark brown, without yellow markings.......3
Thorax wholly or in part yellow........................5
3. Head and body very slender, subopaque, and sharply shagreened. Length 6 mm..............................*maurus*, sp. nov.
Head and body shorter, shining. Length 3–5 mm...........4
4. Thorax and first gastric segment brown......*lienosus*, sp. nov.
Upper portion of first gastric segment ivory yellow.
respiciens Sm. var. *moestus*, sp. nov.
5. Thorax and legs partly black............................6
Thorax and legs entirely yellow..............*rufithorax Emery.*
6. Yellow of thorax of a whitish or ivory tint....*respiciens* Smith.
Pale portions of thorax orange-yellow......................7
7. Epinotum more or less yellow above......................8
Epinotum black...9
8. Pro- and mesoëpinotum yellow above an oblique line running from the ventral border of the pronotum to the epinotal angle.
pictus Emery.
Only the ventral portion of the meso- and epinotum black.
pictus var. *palliatus*, var. nov.
9. Only the pronotum yellow....*pictus* var. *bimaculatus*, var. nov.
Both the pro- and mesonotum yellow above.
pictus var. *lepidus*, var. nov.
10. Pronotum with a conspicuous arc of erect hairs; epinotum low and bluntly angular..........................*major* Forel.
Pronotum without erect hairs; epinotum higher and more sharply angular..11
11. Gaster entirely black...........*haddoni* subsp. *rufoniger* Forel.
Gaster more or less yellow................................12

12. Gaster entirely or almost entirely yellow..................15
Gaster black at least behind the second segment............13
13. Head entirely yellow........................*haddoni* Emery.
Vertex and occiput black...................................14
14. Second gastric segment yellow only at the base.
diadematus, sp. nov.
Second gastric segment entirely yellow.
diadematus var. *dubius*, var. nov.
15. Third and fourth gastric segments with black markings on the sides; workers dimorphic, minor worker with infuscated vertex and occiput......................*jocosus*, sp. nov.
Gaster entirely yellow or with only the anal segment blackened; workers monomorphic, head of small workers not infuscated behind...16
16. Body shining, very indistinctly shagreened. Length 3–4.5 mm.
manni, sp. nov.
Body opaque, sharply shagreened. Length 5.8 mm.
linnaei Forel.

1. Opisthopsis respiciens (F. Smith).

Plate **1**, fig. 1, 2.

Formica (*Myrmecopsis*) *respiciens* F. Smith, Journ. Linn. soc. Zool., 1864, **8**, p. 68, ☿, pl. 4, fig. 3, 3a.

Myrmecopsis respiciens Mayr, Journ. Mus. Godeffroy, 1876, **12**, p. 76, ☿.

Opisthopsis (*Myrmecopsis*) *respiciens* Forel, Ann. Soc. ent. Belg., 1893, **37**, p. 461, ☿ ♀.

Opisthopsis respiciens Emery, in Dalla Torre, Cat. Hymen., 1893, **7**, p. 219, ☿; Emery, Ann. Soc. ent. Belg., 1895, **39**, p. 353; Emery, Mem. R. accad. sci., ist. Bologna, 1896, ser. 5, **5**, p. 776; Froggatt, Agric. gaz. N. S. W., 1905, p. 28, ☿; Forel, Ergeb. Hamb. S. W. Austr. Forschungsreise, 1907, **1**, p. 229, ☿; Viehmeyer, Abh. ber. K. zool. anthr. ethn. mus. Dresden, 1912, **14**, p. 23.

Worker. Length 3–4.5 mm.

Head evenly convex dorsally and ventrally, with straight posterior margin and evenly convex sides, which converge anteriorly in the region of the cheeks. Eyes large and prominent, rather close together. Mandibles 5-toothed, with convex external borders. Clypeus distinctly carinate. Profile outline of mesonotum and base of epinotum forming a straight horizontal line, scarcely interrupted at the meso-ëpinotal suture. Base and declivity of epinotum subequal, the latter sloping and concave, forming a well-defined obtuse angle with the base. Petiole oval, broader above than below, a little higher than broad, with broadly rounded, entire and sharp superior border, in profile thin and anteroposteriorly compressed, convex in front above, flat behind, nearly or quite as high as the epinotal angle.

Shining; head and thorax sharply and finely, gaster and legs more indistinctly and more superficially shagreened. Mandibles and clypeus subopaque, the former also sparsely punctate.

Hairs pale yellow, very sparse, erect, present only on the head and gaster, tips of the femora and antennal scapes. Pubescence absent, except on the antennae, where it is extremely fine.

Black; upper portion of pronotum and first gastric segment and extreme base of second gastric segment, sometimes as two blotches, ivory-yellow; mandibles, cheeks, more or less of the anterior portion of the clypeus, the antennal scapes, tibiae, tarsi, tips of femora, and base of petiole brownish yellow. Palpi, first funicular joint, articulations of thorax, borders of gastric segments and sometimes also the mesonotum brown. Eyes pearl-gray.

New Guinea, type-locality (F. Smith). Queensland: Rockhampton and Peak Downs (Museum Godeffroy); Cairns and Kuranda (Wheeler). N. W. Australia: Adelaide River and Baudin Islands (J. J. Walker). New South Wales: Sydney (Museum Godeffroy).

I have been unable to find this ant in New South Wales so that I doubt its occurrence at Sydney. Mayr applied the name *respiciens* to several species of Opisthopsis, so that even his localities Rockhampton and Peak Downs, Queensland, may refer to some other species. In the neighborhood of Cairns and Kuranda, the typical *respiciens* is not uncommon, running on the trunks of large Eucalyptus and Melaleuca trees along paths and in clearings in the tropical "scrub," in company with workers of various species of Camponotus, Calomyrmex, Polyrhachis, and Podomyrma. I was unable to find its nests or to secure male and female specimens.

2. OPISTHOPSIS RESPICIENS var. MOESTUS, var. nov.

Worker. Differing from the typical *respiciens* in having the pronotum entirely black or dark brown above and the dark dorsal portion of the petiole and of the cheeks more extensive. The pale ivory-yellow area at the base of the second gastric segment is also more restricted. The epinotal angle seems to be somewhat more acute in profile than in the typical form.

Female (deälated). Length 10 mm.

Head a little longer than broad, with straight, anteriorly converging sides and slightly convex posterior border. Eyes proportionally smaller than in the worker. Ocelli small. Thorax elongate elliptical, a little narrower through the wing-insertions than the head through the eyes. Epinotum in profile with very short, convex base and long, abruptly sloping declivity, concave below. Petiolar border feebly emarginate in the middle. Gaster large, broadly elliptical, somewhat flattened dorsoventrally.

Pilosity and sculpture as in the worker.

Black; apical half of mandibles, antennal scapes, wing-insertions, and tarsi dark brown; tibiae and apical fourth of femora brownish red. Eyes black.

Male. Length nearly 5 mm.

Slender; head through the eyes as broad as long; eyes large, convex, nearly circular, as long as the cheeks, which are straight and converge anteriorly. Mandibles small, edentate, with acute tips. Clypeus convex, carinate. Antennae slender; scapes as long as the basal seven joints of the funiculus; first funicular joint as long as the second but broader, remaining joints subequal, more than twice as long as broad. Thorax not broader than the head through the eyes; mesonotum as long as broad, convex in front and overarching the pronotum. Epinotum with subequal base and declivity, the former convex, the latter straight and vertical in profile. Petiole cuneate in profile, with concave posterior surface, its superior margin sharp and distinctly and rather broadly notched in the middle. Gaster slender, elongate elliptical, with small genital appendages. Legs slender. Wings without a discal cell.

Sculpture as in the worker.

Hairs short, delicate, pale, more abundant than in the worker and as numerous on the thorax as on the gaster.

Black; knees, tips of tibiae, and tarsi piceous. Wings yellowish hyaline, with pale yellow veins and pterostigma. Eyes dark brown.

QUEENSLAND: Townsville, type-locality (F. P. Dodd); Cairns (Wheeler).

Described from one female, one male, and four workers taken by F. P. Dodd and belonging to the Museum of South Australia. The workers of this series agree perfectly with numerous specimens taken by myself at Cairns, running on tree-trunks with the typical *respiciens*.

3. OPISTHOPSIS MAURUS, sp. nov.

Plate **3**, fig. 18, 19.

Worker. Length 6 mm.

Body long and slender; head $\frac{1}{4}$ longer than broad, flattened dorsally and ventrally, with long, straight, anteriorly converging sides and distinctly concave posterior border. Eyes large and prominent. Mandibles 5-toothed, their external borders rather straight. Clypeus distinctly carinate. Antennal scapes extending only a short distance beyond the posterior orbits. Thorax slender and low, its dorsal outline in profile straight and horizontal, very feebly interrupted at the promesonotal and mesoëpinotal sutures. Epinotum with distinct but rounded obtuse angle between the subequal base and declivity. Petiole with semicircular, entire superior border, compressed anteroposteriorly, feebly convex in front, flat behind. Gaster long and narrow, with pointed tip and the anterior surface of the basal segment scarcely truncated.

Subopaque; densely and sharply shagreened; head and gaster with small, scattered, piligerous punctures; mandibles more densely and more coarsely punctate; surface of clypeus uneven.

Hairs pale grayish, sparse, present only on the head and gaster and on the tips of the femora and antennal scapes.

Black; knees, tips of tibiae, bases of mandibles, and eyes dark brown.

Described from a single specimen taken at Koah, Queensland, in a nest of *O. haddoni* occupying the basal galleries of a conical termitarium. The specimen is so different in shape, sculpture, and color from the workers of *haddoni* and from all of the other members of the genus that I believe it must represent a distinct species. It had probably been reared from a larva or pupa kidnapped and brought into the nest by the *haddoni* workers.

4. OPISTHOPSIS PICTUS Emery.

Plate **3**, fig. 27.

Opisthopsis pictus Emery, Ann. Soc. ent. Belg., 1895, **39**, p. 354, ☿ fig. 3B.; Emery, Mem. R. accad. sci. ist. Bologna, 1896, ser. 5, **5**, p. 776; Froggatt, Agric. gaz. N. S. W., 1905, p. 28.

Worker. Length 4–5 mm.

Head rather flat dorsally and ventrally, twice as long as high, with large, prominent eyes and feebly concave posterior border, its sides feebly convex in large workers, straight in small individuals. Mandibles 5-toothed, with rather straight external borders. Clypeus distinctly carinate behind. Thorax evenly compressed laterally in the epinotal region, base of the latter in profile straight and horizontal, scarcely impressed at the mesoëpinotal suture; base and declivity meeting at a sharp obtuse angle, the declivity abruptly sloping and concave. Petiolar scale slightly thinner and lower than in *respiciens*, its anterior and posterior surfaces flat, the former convex above where it meets the rounded, entire and rather sharp superior border. Gaster elongate elliptical, of the usual shape, with the anterior surface of the first segment truncated.

Rather shining; head more opaque and more sharply shagreened; gaster very finely and transversely striolate, with silky luster; mandibles coarsely punctate and somewhat striate near their apical borders.

Hairs sparse, whitish, erect, blunt, most numerous on the head and gaster; thorax and petiole without hairs, except a few on the dorsal surface of the pronotum.

Head black, with the mandibles and anterior border of the cheeks and clypeus lemon-yellow. Antennal scapes orange-yellow; funiculi black, in some specimens with the first joint brown or yellowish. Palpi black. Pronotum and dorsal portions of mesonotum and epinotum above an oblique line on each side running from the inferior border of the pronotum to the epinotal angle, orange-yellow; below this line and including the prosternum, black. Scale of petiole brown or blackish, its basal portion yellow. Gaster black, first and second segments orange-yellow, with the sides more or less infuscated or black. Coxae, trochanters, and basal $\frac{2}{3}$ of femora black, remainder of femora and tibiae orange-yellow; tarsi more brownish. The yellow of the legs and gaster is distinctly paler than that of the thorax. Eyes black in some specimens, in others pearl-gray.

QUEENSLAND: Kamerunga, type-locality (Podenzana); Townsville (F. P. Dodd); Nelson (A. A. Girault).

I have redescribed this form from four workers taken by F. P. Dodd and belonging to the Museum of South Australia. With the exception of a single worker taken by Girault at Nelson, all the other specimens of the species in my collection belong to the three following undescribed varieties.

5. Opisthopsis pictus var. palliatus, var. nov.

Plate 3, fig. 28.

Worker. Differing from the typical *pictus* in color, the black of the thorax being restricted to the lowermost portions of the meso- and epinotum. Some specimens have the prosterna black. The black of the femora does not extend beyond their basal third or half. The petiolar scale is only slightly infuscated at the superior border. The first two gastric segments are orange-yellow, only a little paler than the thoracic dorsum and there is a large brown spot on each side of the second segment. Eyes pearl-gray.

Queensland: Sunnybank, near Brisbane, type-locality (Wheeler); Mungar Junction (A. M. Lea).

This variety is distinctly transitional to *O. rufithorax* Emery.

6. Opisthopsis pictus var. lepidus, var. nov.

Plate 1, fig. 3, 4.

Worker. Differing from the preceding forms in the color of the thorax. Only the pronotum and dorsal portion of the mesonotum are orange-yellow, the remainder black. Even the lower border of the pronotum is black in some specimens. Legs and gaster as in the typical *pictus,* though some specimens have the posterior portion of the second segment black or the yellow reduced to a large bilobed spot at the anterior border of the segment. First funicular joint as black as the succeeding joints. Eyes pearl-gray. The epinotal angle is very sharp in many specimens and the concavity of the declivity even more abrupt than in the figure 3.

Queensland: Townsville, type-locality, Kuranda, Koah, and Sunnybank, near Brisbane (Wheeler); Mackay (Turner).

7. Opisthopsis pictus var. bimaculatus, var. nov.

Worker. Length 5 mm.

Larger and more robust than the preceding forms, with the sides of the head distinctly more convex. The orange-yellow color is still further restricted on the thorax and confined to the dorsal portion of the pronotum. Petiole entirely black. Only the dorsal portion of the first gastric segment and two large, sharply defined, elliptical spots on the base of the second segment are orange-yellow, just perceptibly paler than the pronotum. The femora are black, with only their tips reddish, the tibiae reddish brown. Mandibles and anterior corners of cheeks red. Eyes pearl-gray.

Described from a single specimen found running on one of the white-trunked Eucalyptus trees on the mountain west of Townsville, Queensland.

8. OPISTHOPSIS RUFITHORAX Emery.

Plate **1**, fig. 5, 6.

Opisthopsis rufithorax Emery, Ann. Soc. ent. Belg., 1895, **39**, p. 354, ☿, fig. 3A.; Emery, Mem. R. accad. sci. ist. Bologna, 1896, ser. 5, **5**, p. 776; Froggatt, Agric. gaz. N. S. W., 1905, p. 28, ☿; Forel, Ark. f. zool., 1915, **9**, p. 95, ☿ ♀.

Worker. Length 4–5 mm.

Very similar to *pictus* in structure, but with the dorsal outline of the thorax in profile a little more rounded and the epinotum slightly lower and with a somewhat more rounded angle.

Sculpture and pilosity as in *pictus.*

Color of head and antennae as in *pictus;* thorax, legs, and petiole orange-yellow throughout, last tarsal joint blackish or dark brown. Gaster black, with the first two segments either entirely orange-yellow, of a slightly paler tint than the thorax, or with the sides of these segments and the posterior portion of the second blackish.

Female. Length 7–10 mm.

"Head behind broader than in the worker, cheeks not convex. Thorax as broad as the head. Occiput, vertex and funiculus brown. Scutellum and a narrow but clearly defined transverse band on each gastric segment black. All the remainder of the body yellowish red, only the middle of the pronotum infuscated. Wings lacking. In all other respects like the worker." (Forel).

QUEENSLAND: Peak Downs, type-locality (Museum Godeffroy); Atherton and Cedar Creek (E. Mjöberg); Enoggera and Sunnybank, near Brisbane (Wheeler); Gayndah, Bundaberg, and Mungar Junction (A. M. Lea); Cairns (F. P. Dodd). NEW SOUTH WALES: Manilla (W. W. Froggatt). SOUTH AUSTRALIA: Moorooloo, Flinders Range (S. A. White). WEST AUSTRALIA: Mullewa (Miss F. May); Clarence River (A. and F. Zietz).

This form is so close to *pictus* that it might properly be regarded as a subspecies or variety of that species. The specimens which I took at Enoggera and Sunnybank were running about on Eucalyptus trunks and on the ground. Mjöberg found the species nesting in clay about the roots of trees at Atherton and Cedar Creek.

9. OPISTHOPSIS HADDONI Emery.

Plate **2**, fig. 11–16; Plate **3**, fig. 29.

Opisthopsis haddoni Emery, Rev. Suisse zool., 1893, **1**, p. 226, ☿; Emery, Mem. R. accad. sci. ist. Bologna, 1896, ser. 5, **5**, p. 776; Froggatt, Agric. gaz. N. S. W., 1905, p. 28; Viehmeyer, Abh. ber. K. zool. anthr. ethn. mus. Dresden, 1912, **14**, p. 23; Forel, Ark. f. zool., 1915, **9**, p. 95, ☿; Crawley, Ann. mag. nat. hist., 15, 1915, ser. 8, **15**, p. 135, ☿.

Worker. Length 3–5.5 mm.

Head evenly convex dorsally and ventrally, with straight posterior border, in large workers with very feebly convex, in small workers with straight sides. Mandibles 5-toothed, their external borders rather straight. Clypeus carinate at the base. Thorax and petiole shaped much as in *rufithorax,* the former rather short, with blunt epinotal angle.

Shining; head and thorax more opaque than the gaster and more distinctly shagreened. Mandibles shining, sparsely punctate.

Hairs whitish, sparse, erect, blunt, absent on the thorax and petiole.

Clear orange-yellow, vertex and occiput of head a little darker, cheeks, clypeus, and mandibles more lemon-yellow, the teeth of the mandibles brown. Gastric segments behind the second, palpi, and funicular joints, except the first, black. Terminal tarsal joints brown or reddish. Eyes black.

Female. Length 8–9 mm.

Head shaped like that of the worker but a little broader, a little narrower than the thorax through the wing-insertions, with nearly straight sides. Mandibles 6-toothed. Mesonotum as broad as long, epinotum with distinct base and declivity, the former short and convex, the latter vertical and concave in profile. Petiole as in the worker, but with its superior border feebly notched in the middle. Gaster rather large, elongate elliptical. Wings moderately long, with well-developed, triangular discal cell.

Sculpture and pilosity as in the worker, except that the head and thorax are as smooth and shining as the gaster.

Color like that of the worker, but with the scutellum and metanotal sclerite black and the wing-insertions dark brown. Wings yellowish hyaline, with pale brown veins and pterostigma. Eyes black.

Male. Length 4–4.5 mm.

Head through the eyes as broad as long, with straight, anteriorly converging cheeks as long as the eyes. Mandibles small, with acute tips and oblique, edentate apical borders. Clypeus ecarinate. Frontal carinae short. Antennae slender; scapes as long as the seven basal joints of the funiculus; first funicular joint as long as the second but thicker; all the funicular joints subequal, more than twice as long as broad. Thorax through the mesonotum a little broader than the head through the eyes, convex and prominent in front. Epinotum very convex, sloping, without distinct base and declivity. Petiole lower and thicker than in the worker, cuneate in profile, its superior border rather blunt and rather deeply and angularly notched in the middle. Gaster slender, with small, slender, exserted genitalia. Legs slender. Wings with small, triangular discal cell.

Shining and distinctly shagreened; head rather opaque above; mesonotum sparsely and coarsely punctate.

Pilosity as in the worker, but with short, sparse erect hairs also on the mesonotum.

Black; antennae piceous brown; mandibles, corners of the cheeks, mouthparts, legs, and wing-insertions yellowish brown, the middle portions of the femora darker. Wings grayish hyaline, with pale brown veins and pterostigma. Eyes pearl-gray.

MURRAY ISLANDS: Torres Strait, type-locality (A. C. Haddon). QUEENSLAND: Townsville (W. W. Froggatt); Laura, Cape York, and Colosseum (E. Mjöberg); Koah, Kuranda, and Townsville (Wheeler); Cairns (A. M. Lea). NORTHERN TERRITORY: Point Charles (G. F. Hill); Daly River (H. Wesselmann); Melville Island (F. P. Dodd). CENTRAL AUSTRALIA: Tennant's Creek (J. F. Field). NORTH WEST AUSTRALIA: Broome, Kimberley District (E. Mjöberg).

Redescribed from a worker cotype and numerous specimens of all three phases taken by myself in termite nests at Koah, Kuranda, and Townsville. Dr. E. Mjöberg had previously observed its occurrence in these structures. More rarely it nests under stones without relations to termites. The winged sexual phases were found in the nests October 31 to November 6. The species is evidently widely distributed over tropical Australia and will probably be found in New Guinea.

10. OPISTHOPSIS HADDONI subsp. RUFONIGER Forel.

Plate **2**, fig. 17.

Opisthopsis haddoni race *rufoniger* Forel, Rev. Suisse zool., 1910, **18**, p. 70, ☿.

Worker. Length 3–7 mm.

Differing from the worker of the typical *haddoni* in the more acutely angular epinotum, in having the superior border of the petiolar scale feebly emarginate in the middle, in the color of the gaster, which is entirely black, and of the antennal funiculi, the basal third or half of which is brownish or yellowish. Eyes pearl-gray, brown or black.

Female (deälated). Length 8 mm.

Differing from the female *haddoni* in having the entire gaster black and the base of the funiculus brown, but the metanotum and scutellum are orange-yellow, the latter with brown spots. Eyes pearl-gray.

Male. Length 3 mm.

Smaller than the male of *haddoni* and with the body dark brown instead of black (possibly due to immaturity or prolonged immersion in alcohol). The head seems to be shorter, the wings are more opaque. Eyes pale brown.

CENTRAL AUSTRALIA: Tennant's Creek, type-locality (J. F. Field).

Redescribed from numerous workers, a single female and three males belonging to the cotype series and loaned me by the Museum of South Australia.

11. OPISTHOPSIS LIENOSUS, sp. nov.

Plate **2**, fig. 9, 10.

Worker. Length 4–5 mm.

Closely related to *haddoni.* Sides of head feebly convex, rather strongly converging in front, posterior border straight or very feebly convex. Eyes moderately large. Mandibles 5-toothed, with convex external borders. Clypeus distinctly carinate. Thorax with rather sharp mesoëpinotal angle and the promesonotal and mesoëpinotal sutures slightly but distinctly impressed. Petiolar scale thin, its upper border rounded, straight in the middle and in some specimens feebly impressed. Gaster and legs of the usual structure.

More shining than *haddoni,* very finely shagreened, upper surface of head with a silky luster. Mandibles shining, sparsely punctate.

Pilosity as in *haddoni*, lacking on the thorax and petiole.

Black; sides and anterior portion of head, thorax, coxae, petiole, first gastric segment and in some specimens the extreme base of the second, castaneous brown. Antennal scapes, first funicular joint and legs yellowish brown, femora darker in the middle. Mandibles yellow, with black teeth. Eyes pearl-gray.

Described from eight specimens taken in three colonies of *O. haddoni* at Koah, Queensland, October 29. Like the specimen of *O. maurus*, they had probably been reared from kidnapped larvae or pupae.

12. OPISTHOPSIS DIADEMATUS, sp. nov.

Plate **3**, fig. 20, 21.

Worker. Length 4–5 mm.

Head very convex dorsally, ventrally and laterally, so that the cheeks have a swollen appearance. Posterior border straight. Eyes rather small and far apart. Mandibles with slightly convex external borders, the apical borders not very oblique, their five teeth small and subequal. Clypeus broader than long, indistinctly carinate. Thorax rather robust, with well-marked promesonotal and mesoëpinotal sutures; the base and declivity of the epinotum subequal, the former slightly concave, the latter abruptly sloping and concave, the angle between them blunt but prominent. Petiolar scale of the usual shape, nearly as high as the epinotal angle. Gaster rather large.

Shining, very finely shagreened and sparsely and finely punctate; mandibles more coarsely punctate.

Hairs pale yellow, sparse, erect; absent on the thorax and petiole.

Orange-yellow, head not paler in front; funiculi, except their basal joint, space between the eyes and including the vertex and occiput, gastric segments behind the second, all but the base of the second above and in some specimens a spot on each side of the first segment, black. Posterior borders of gastric segments pale brown. The yellow of the anterior gastric segments is distinctly paler than that of the legs. Palpi dark brown. Eyes dark brown or black.

Described from seven workers taken at Townsville, Queensland, on the bark of Eucalyptus trees and undoubtedly belonging to several colonies.

13. Opithopsis diadematus var. dubius, var. nov.

Worker. Length 4.5 mm.

Differing from the typical *diadematus* in having the head more flattened as in *rufithorax* and in having the second gastric segment entirely orange-yellow above.

A single specimen taken by Mr. A. M. Lea at Longreach, Queensland. Perhaps this form should be regarded as a variety of *rufithorax*, and perhaps *diadematus* should be regarded as a subspecies of that form. The head of the new variety is certainly intermediate in shape between the two, though its coloration is that of *diadematus*.

14. Opisthopsis major Forel.

Plate **1**, fig. 7, 8.

Opisthopsis major Forel, Rev. Suisse zool., 1902, **10**, p. 492, ☿; Froggatt, Agric. gaz. N. S. W., 1905, p. 28, ☿; Forel, Rev. Suisse zool., 1910, **18**, p. 70, ☿.

Worker. Length 4.5–7 mm.

Averaging larger than most of the preceding species. Head rather broad, evenly convex above and below, with convex sides, straight posterior border and rather small eyes. External borders of the 5-toothed mandibles convex. Clypeus broader than long, indistinctly carinate. Funicular joints a little shorter than in the preceding species. Thorax with the epinotum decidedly lower, so that the outline of the mesonotum and base of the epinotum, though forming a straight line, slopes backwards; base and declivity of epinotum subequal, forming a rounded and very obtuse angle. Petiole of the usual shape, its scale as high as the epinotal angle. Gaster and legs of the usual shape.

Shining, very finely and indistinctly shagreened and very finely and sparsely punctate. Mandibles coarsely shagreened and punctate.

Hairs yellow, erect, sparse on the head and gaster, absent on the thorax and petiole, except on the pronotum where they form a conspicuous tuft arranged in a semicircle. Pubescence almost absent, very short and dilute on the sides of the head.

Orange-yellow; mandibular teeth brown; antennal funiculi, except their basal joint, gaster behind the second segment, posterior half or two thirds of the second segment and a narrow transverse band near the posterior margin of the first segment, black or dark brown. Eyes pearl-gray or black.

Female. Length 8–8.5 mm.

Head like that of the worker, but a little shorter. Mandibles 5-toothed. Thorax elongate elliptical, through the wing-insertions not broader than the head through the eyes. Mesonotum distinctly broader than long. Epinotum with distinct base and declivity, the former short and convex, the latter long, abruptly sloping and concave in profile. Petiolar scale with very feebly emarginate superior border. Gaster elliptical, as long as the thorax. Wings rather short (7 mm.), with a well-developed, triangular discal cell.

Sculpture and pilosity as in the worker, but mesonotum and scutellum smoother and more shining, pronotum without hairs and mesonotum sparsely hairy.

Color like that of the worker but with the scutellum and middle of the metanotal sclerite black. Wings distinctly tinged with yellow, especially towards the base, with resin-yellow veins and pterostigma. Eyes black.

QUEENSLAND: Mackay, type-locality (Turner); Cape York; Townsville (F. P. Dodd); Rockhampton (A. M. Lea).

I have examined two cotype workers received from Professor Forel, four workers and a female taken by Mr. Dodd and a worker taken by Mr. Lea.

This species is very distinct in its average large size, in the structure of the epinotum of the worker, the conspicuous tuft of hairs on the pronotum and the color of the gaster. In Fig. 7 the epinotal angle is too sharp and the base and declivity should be more nearly equal. The head, represented in Fig. 8, is a little too broad.

15. OPISTHOPSIS JOCOSUS, sp. nov.

Plate **3**, fig. 22–24.

Worker. Length 4–6.5 mm.

Head of the largest workers large and very broad through the middle, with very convex sides and feebly concave posterior border, narrowed at the anterior border; in profile evenly convex above and below; in the smallest workers the head is narrow, with straight sides and more concave posterior border and its dorsal and ventral surfaces are less convex. Eyes far apart, relatively larger in the small workers. Mandibles with feebly concave external borders, 5-toothed. Clypeus broader than long, rather flat, ecarinate. Thorax with the pronotum convex behind, the dorsal outline of the mesonotum and base of epinotum continuous and very straight, the base and declivity of the epinotum subequal, forming a sharp angle. Petiolar scale much compressed anteroposteriorly, not quite as high as the epinotal angle, with sharp, entire and rounded superior border. Gaster and legs of the usual shape.

Only moderately shining, finely shagreened, gaster more sharply and transversely and with a silky luster. Mandibles shining, finely punctate.

Hairs yellow, short, sparse, erect, absent on the thorax and petiole. Pubescence distinct, but very short and dilute on the cheeks and sides of the head.

Dull brownish yellow; palpi brown; funiculi, except the basal joint, and anal segment of gaster black; second, third, and fourth gastric segments with a narrow black spot of variable extent near the ventral margin on each side. Small workers with the space between the eyes dark brown. Sometimes this area is reduced to three ocellus-like spots with vague outlines.

Described from numerous specimens taken in a piece of dry woodland near the Baron Falls at Kuranda, Queensland from a single colony evidently hunting for the brood of an Iridomyrmex nest which I had excavated in the soil a few hours previously. *O. jocosus* is a very distinct form not only in the peculiar shape of the head of the larger worker, the shape of the epinotum and the coloration of the gaster but also in having clearly dimorphic workers.

16. OPISTHOPSIS LINNAEI Forel.

Opisthopsis linnaei Forel, Mitth. Zool. mus. Berlin, 1901, **2**, p. 26, ☿; Dahl, Leben d. ameis. Bismarck Archip., 1901, p. 42; Viehmeyer, Abh. ber. K. zool. anthr. ethn. mus. Dresden, 1912, **14**, p. 23.

Worker. Length 5.8 mm.

"Closely related to *O. haddoni*, but entirely opaque, including the mandibles and legs; only the head anteriorly and on the sides, shining. The striated and reticulated sculpture is deeper, sharper and microscopically uneven. The sides of the rather elongated head are less convex (very feebly convex). Gaster entirely yellow (in *haddoni* the posterior half is black). In other respects like *haddoni* but the color is less vivid, more of a dirty, rusty yellow." (Forel).

BISMARCK ARCHIPELAGO: Ralum (Fr. Dahl).

I have not seen this species, which Forel described from two specimens so badly damaged that he could not determine the form of the thorax. According to Dahl, it nests in rotten portions of tree-trunks. It seems to be rather closely related to the following species.

17. OPISTHOPSIS MANNI, sp. nov.

Plate 3, fig. 25, 26.

Worker. Length 3–4.5 mm.

Smaller than the preceding species. Head long, with straight, anteriorly converging sides, straight posterior border and large, prominent eyes. Mandibles 5-toothed, with rather convex external borders. Clypeus broader than long, subcarinate. Thorax shaped much as in *O. haddoni,* the base and declivity of the epinotum subequal, the former straight and horizontal, the latter abruptly sloping and concave, the angle between very distinct but slightly rounded. Petiolar scale apparently a little thicker than in most species of the genus, its superior border not so high as the epinotal angle, straight and transverse in the middle. Gaster and legs of the usual shape.

Smooth and shining, not distinctly shagreened, the head and mandibles slightly more opaque than the thorax and gaster, the mandibles with fine, scattered and indistinct punctures.

Hairs sparse, yellow, erect and rather short, absent on the thorax and petiole. Pubescence absent.

Clear orange-yellow; cheeks, clypeus, and mandibles paler and more lemon-yellow; anal segment, last tarsal joint and funiculi, with the exception of the first joint, black. Palpi yellowish. Eyes pearl-gray.

Female (deälated). Length 6.5 mm.

Very similar to the worker; head a little broader, broader than the elongate elliptical thorax. Petiolar scale with entire, rounded superior border.

Sculpture, pilosity, and color as in the worker, except that the scutellum is black.

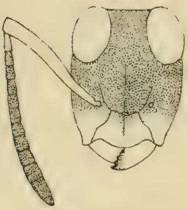
Described from several workers and a female from Malapaina (type-locality) and several workers from Malaita and Yandina, British Solomon Islands. These specimens were recently taken by Dr. W. M. Mann, who writes me as follows concerning their habits: "The only note I have on the Malapaina specimens of Opisthopsis is that they were nesting beneath bark in a depression on the trunk of a recently felled tree. The colony was composed of only a couple of dozen workers and one female. The workers made no attempt to save any of the few larvae that were in the nest. The specimens from Malaita and Yandina were found running on tree-trunks. The species is evidently very widely distributed in the Solomons but is rarely seen, probably because of its arboreal habits. It is very active and difficult to catch."

EXPLANATION OF THE PLATES.

PLATE 1.

PLATE 1.

Fig. 1. *Opisthopsis respiciens* (F. Smith). Worker.
Fig. 2. Head of same.
Fig. 3. *Opisthopsis pictus* Emery var. *lepidus* Wheeler. Worker.
Fig. 4. Head of same.
Fig. 5. *Opisthopsis rufithorax* Emery. Worker.
Fig. 6. Head of same.
Fig. 7. *Opisthopsis major* Forel. Worker.
Fig. 8. Head of same.



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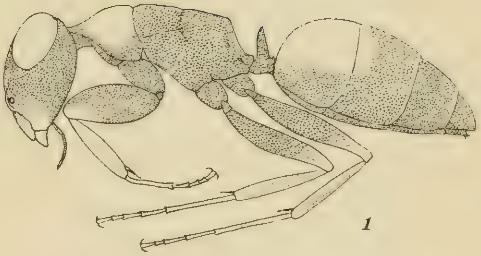

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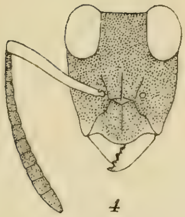

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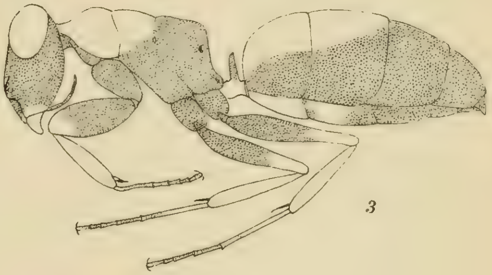

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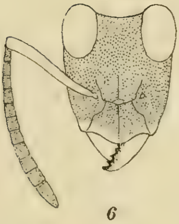

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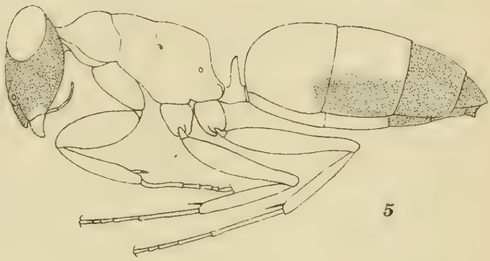

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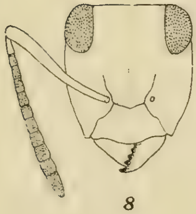

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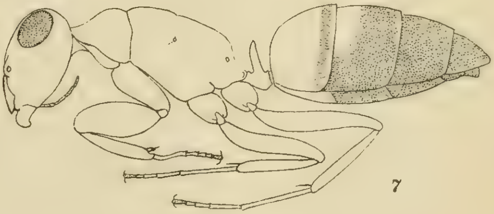

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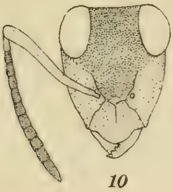
PLATE 2.

PLATE 2.

Fig. 9. *Opisthopsis lienosus* Wheeler. Worker.
Fig. 10. Head of same.
Fig. 11. *Opisthopsis haddoni* Emery. Worker.
Fig. 12. Head of same.
Fig. 13. *Opisthopsis haddoni* Emery. Female.
Fig. 14. Head of same.
Fig. 15. Fore wing of same.
Fig. 16. *Opisthopsis haddoni* Emery. Head of male.
Fig. 17. *Opisthopsis haddoni* subsp. *rufoniger* Forel. Worker.



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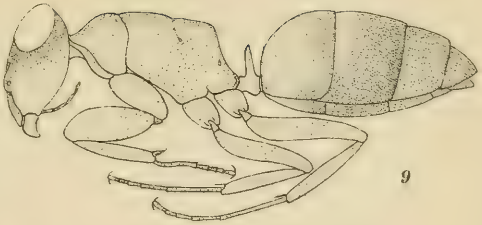

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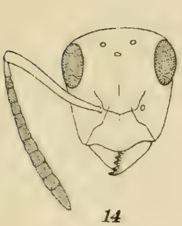

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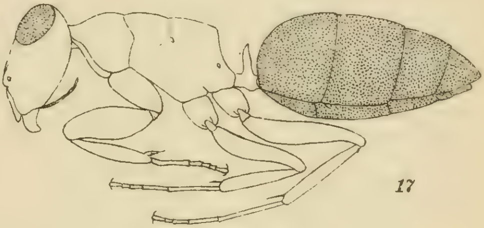

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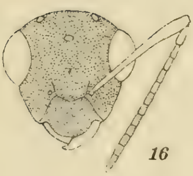

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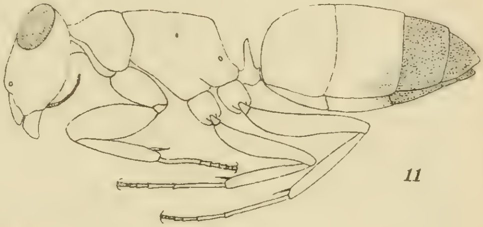

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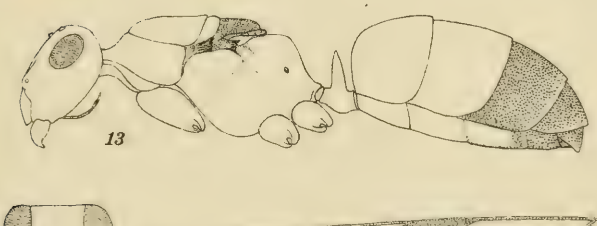

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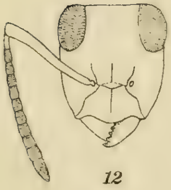

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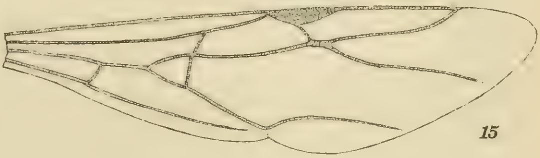

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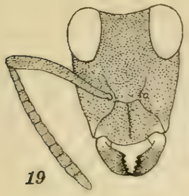
PLATE **3.**

PLATE 3.

Fig. 18. *Opisthopsis maurus* Wheeler. Worker.
Fig. 19. Head of same.
Fig. 20. *Opisthopsis diadematus* Wheeler. Worker.
Fig. 21. Head of same.
Fig. 22. *Opisthopsis jocosus* Wheeler. Worker major.
Fig. 23. Head of same.
Fig. 24. Head of worker minor of same.
Fig. 25. *Opisthopsis manni* Wheeler. Worker.
Fig. 26. Head of same.
Fig. 27. *Opisthopsis pictus* Emery. Thorax of worker.
Fig. 28. *Opisthopsis pictus* var. *palliatus* Wheeler. Thorax of worker.
Fig. 29. *Opisthopsis haddoni* Emery. Proventriculus ("gizzard").



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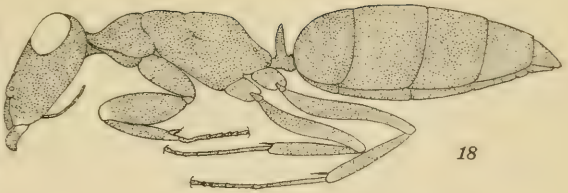

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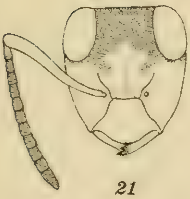

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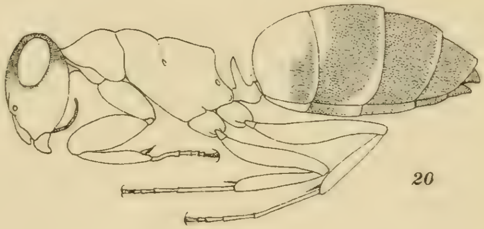

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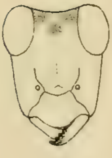

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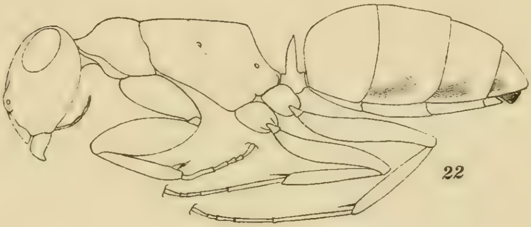

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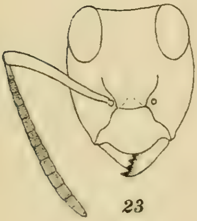

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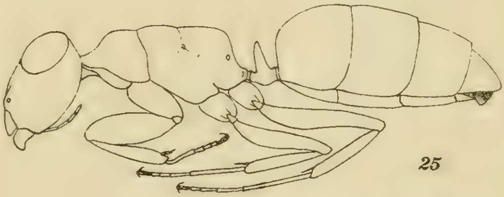

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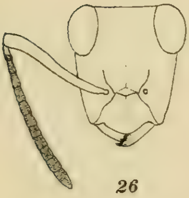

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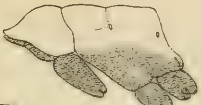

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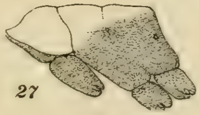

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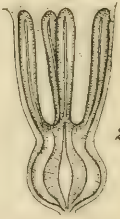

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SOME MEDUSAE AND SIPHONOPHORAE FROM THE WESTERN ATLANTIC.

By Henry B. Bigelow.

With Eight Plates.

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No. 8.— *Some Medusae and Siphonophorae from the Western Atlantic.*

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INTRODUCTION.

The Medusae and Siphonophorae described here were collected by the United States Coast Survey Steamer Bache, January to March, 1914, and by the United States Fisheries Schooner Grampus, off Chesapeake Bay, in August, 1916.

The itinerary of the cruise of the Bache has been published (1917a); but for convenience, the stations at which Medusae or Siphonophorae were taken are listed (p. 435).

The collections were made, and the material preserved, by Mr. W. W. Welsh, of the Bureau of Fisheries, who, in spite of stormy weather, handled this fragile material successfully.

The synonymies of the better known species are, as a rule, omitted, full references to the earlier literature on the Medusae having been given by Mayer (1910); on the Siphonophorae by me (1911b).

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ANTHOMEDUSAE.

Cytaeidae L. Agassiz.

Cytaeis tetrastyla Eschscholtz.

Cytaeis tetrastyla Eschscholtz 1829, p. 104, taf. 8, fig. 2. (For synonymy see Hartlaub, 1911, p. 139; Vanhöffen, 1911, p. 204).

Station				
10,176	50–0 meters	1 spec.	3 mm. high	
10,200	surface	2 "	4 mm. "	both
10,200	100–0 meters	1 "	3 mm. "	
10,208	100–0 "	1 "	4 mm "	

These specimens support Vanhöffen's (1911) contention that a single species of Cytaeis inhabits all three great oceans, for I can find nothing to separate them from the series collected by the Albatross in the eastern Pacific (Bigelow, 1909a, p. 190, "*C. vulgaris*"), with which they agree, not only in general structure, and in the pigmentation of the cores of the tentacles, but in the presence of Medusa buds on the walls of the manubrium.

BOUGAINVILLEIDAE Gegenbaur.

BOUGAINVILLEA NIOBE Mayer.

Bougainvillea niobe Mayer, 1894, p. 236, pl. 1, fig. 2; 1900, p. 42; 1904, p. 11, pl. 2, fig. 14–14c; 1910, p. 166, pl. 18, fig. 1–3.

This species was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,173, 10,176, 10,178, 10,180, 10,186, 10,188, 10,192, 10,195, 10,196, 10,197, 10,200, 10,203, 10,206, 10,208, 10,209, 10,211, in hauls with open nets at various depths from the surface down to 1,000–0 meters; a total of about 80 specimens.

Perhaps no Medusae stand more in need of critical revision than do the members of this genus, for not only are many of the species closely related to one another, but actual observation has proven that some, at least, are merely environmental races of others (Mayer, 1910, p. 159); and in all probability some of the more simply organized "species" are merely the young of the larger and anatomically more complex ones. As Mayer points out (1910, p. 159), the "confusion which prevails at present can not be dissipated until the hydroids of all or most of the species are discovered."

The species recognized by Mayer (1910), and by Hartlaub (1911) in his very useful account of the Bougainvilleas of northern waters, may be divided, for convenience into two groups, those with many (8 or 9) marginal tentacles per bundle, and in which the oral tentacles branch dichotomously five or more times, and those in which either marginal tentacles, or dichotomous branchings of the oral tentacles, or both, are few. The first group includes *B. macloviana*, *B. principis*, *B. fulva*, *B. brittanica*, *B. superciliaris*, *B. nordgardii*, *B. bougainvillei*, and *B. niobe*. Without attempting to settle the relationships of these species to one another, I may point out that *B. niobe* is easily separated from *B. macloviana* by the absence of peduncle, and structure of gonads, which are strictly limited to the manubrium; from *B. superciliaris* and *B. bougainvillei* (which are probably identical) by the absence of a peduncle; from *B. principis* by fewer marginal tentacles, and especially by the smaller, narrower, marginal tentacular pads; from *B. nordgardii* by larger size and presence of ocelli. *Bougainvillea niobe*, *B. brittanica*, and *B. fulva* are closely allied, anatomically, to one another: in all three the bell is high, thick walled, without peduncle, attaining a height of 10–12 mm.; the manubrium short, with broad cruciform basis; there are upwards of 8 marginal tentacles per bundle;

the oral tentacles branch 5–7 times; the gonads are adradial; axial ocelli are present. But the number of marginal tentacles per bundle is greater in *B. brittanica* (16–30) than in *B. niobe* (8–15); and the length of the basal trunk of the oral tentacles (proximal to the first dichotomous branching) is much longer in the former than in the latter.

After actual comparison of specimens, I have not been able to find any constant anatomical differences, other than such as are obviously due to preservation or contraction or to different stages in development, to separate *B. niobe* from *B. fulva*, and should not hesitate to unite them, were it not for the occurrence of Medusa buds on the walls of the manubrium in *B. niobe*, a phenomenon separating it not only from *B. fulva*, but from all known species of Bougainvillea. And so many specimens of *B. fulva* have now been studied, over a range extending across the whole breadth of the Pacific (Maas, 1905, Bigelow, 1909a), and the Indian Ocean (Browne, 1916), that this type of asexual reproduction can hardly have been overlooked in them; whereas it is as frequent in *B. niobe* (Mayer, 1910), as it is in *Rathkea blumenbachii* (Bigelow, 1909c; 1913; Hartlaub, 1911). Nor is this the only Bougainvillea characterized by a peculiar reproductive cycle, *B. superciliaris* carrying the planulae, resulting from its sexual reproduction, in the walls of the manubrium.

An excellent account of the budding phase of *B. niobe* has been given by Mayer (1910); and the present series affords an account of the sexual phase, not previously recorded.

Budding takes place in medium sized specimens, about 5–8 mm. in diameter, a stage in which, as Mayer observed, there are about 8–10 marginal tentacles in each of the four groups, while the oral tentacles branch 4–6 times. Budding specimens compose about one half the present series; and there are almost as many larger specimens (8–10 mm. high) with gonads. The sexual organs are adradial, just as in *B. fulva* (Maas, 1906a, fig. 10c), and *B. brittanica* (Hartlaub, 1911): but the specimens are so contracted that I can not say whether they are entirely discontinuous in the inter-, as they certainly are in the perradii, or whether they are occasionally joined, interradially, at the upper end of the manubrium, as is the case in *B. brittanica*. In the largest specimens there are 12–15 marginal tentacles in each bundle, and the oral tentacles branch 7 or 8 times in several. But these organs are so contracted, or intertwined, that in most cases it is impossible to disentangle them.

Most of the large specimens are so strongly contracted that the bell-opening is entirely closed over by the gelatinous substance of the exumbrella, just as Maas (1905, pl. 1, fig. 8) has figured, and Browne (1916) described it, for contracted *B. fulva.* And this violent contraction likewise results in 4 longitudinal radial furrows in the exumbrella, not present in life (Mayer, 1910). In the few medium sized specimens which are not contracted, the outline of the bell is much as Mayer has figured it.

PANDEIDAE Haeckel.

(*Sens. em.* Bigelow, 1909a; *Tiaridae* Haeckel, 1879; Hartlaub, 1913 (*partim*)).

I have already maintained (1913, p. 12) that the name Tiaridae must be abandoned since Tiara, the generic name, is preoccupied for a mollusc. And though Hartlaub (1913, p. 240) thinks such a change unnecessary, it is in accord with the International code of zoölogical nomenclature, Art. 15. Hartlaub has recently (1913) given a thorough revision of the family. But while I am in full accord with most of his conclusions, it seems to me wiser to retain the Bythotiaridae as a separate family rather than to include them as a "gruppe" (calycopsiden) of the Pandeidae, because the structure of tentacle base and margin, in the various calycopsids, is very different from that of the typical pandeids ("gruppe neoturriden" of Hartlaub).

STOMOTOCA L. Agassiz, 1862.

(*Sensu* Bigelow, 1909a; Hartlaub, 1913; Vanhöffen, 1913a).

Pandeidae with 2 large, opposed, perradial tentacles and many rudimentary tentacles; with the manubrium situated on a gelatinous peduncle.

Mayer (1910) enlarges this genus to include all pandeids with 2 large and many rudimentary tentacles, whether or not a peduncle is present. But this organ is so commonly of generic importance among Medusae, that there seems no reason to deny it that value here.

The three described species, included in this genus as limited here, *S. atra* A. Agassiz, *S. pterophylla* Haeckel, and *S. divisa* Maas, are so closely allied that I have already suggested the unity of the last two, (1909a), while Vanhöffen (1913a) unequivocally unites them all under the oldest name, *S. atra;* though Mayer (1910) retains all three. No previous student, however, has actually compared specimens from the three type-localities: an opportunity afforded by the Eastern Pacific collection (1909a), the present specimens, and by a series of *S. atra*, including A. Agassiz's original specimens, and others collected off Vancouver Island, in 1906.

The BACHE specimens, listed below, confirm my earlier conclusion (1909a, p. 202) that none of the characters used by Maas (1897) to separate *S. divisa* from *S. pterophylla*, *i. e.* presence of an apical projection, swollen tentacular bases, and a coronal furrow, can be relied on. The first two occur equally in *S. pterophylla*, as indeed Mayer (1910) points out, while it is only in occasional specimens from the type-locality of *S. divisa* that the coronal furrow occurs (Bigelow, 1909a, p. 202); this feature was lacking in most of the ALBATROSS examples, and in all recorded by Vanhöffen (1913a, p. 14) from Callao, Peru.

Mayer's figures of *S. pterophylla* (1910, pl. 29, fig. 3–14) suggest that its gonads, and lip, are less complex than those of its Pacific relative. But actual comparison of specimens shows that no sharp line can be drawn between the two in this respect, for the primary sexual folds of Atlantic specimens, 10–12 mm. high, being often bi- or tri-fid with occasional pinnate sublobes (Mayer, 1910, pl. 29, fig. 3, 4), agree with those of Pacific specimens of a corresponding size, though less complex than those of larger Pacific specimens, (Bigelow, 1909a, pl. 43, fig. 6). And this is also true of the crenulations of the lip. In the number of primary sexual folds, too, (7–9), the two agree. And the number of rudimentary tentacles per quadrant (16–21) is about the same in the BACHE as in the Pacific specimens of 20–25 mm. In short, the large *S. pterophylla* agree very closely with $\frac{2}{3}$ grown *S. divisa* in all these characters. And further growth, on the part of *S. pterophylla*, would no doubt lead to what may be called the *S. divisa* stage.

According to Mayer, color separates the two species. And it is certainly true that in all specimens of *S. pterophylla* studied in life (Mayer, 1910, Bigelow, 1917) the stomach and tentacular bulbs were deep brown, whereas in the Pacific specimens I have seen alive (1909a), the gonads were orange to brownish red, tentacular bulbs pale yellow. But color is proverbially inconstant among Medusae. In short, *S. divisa* and *S. pterophylla* belong to one species, of which they represent at most two color-phases.

According to Vanhöffen (1913a) this is likewise true of *S. atra*, and he explains the simplicity of the gonads and of the lip in A. Agassiz's (1865) figures as evidence of immaturity merely. This assumption is not unreasonable, for it is never possible to postulate how far complication of structure may progress with growth, in a Medusa the life-history of which is unknown. But the large size of Agassiz's specimens (20–25 mm. high) argues against it. And the specimens of *S. atra* which I have myself studied (1909a) suggest that the simplicity of gonads and lip is permanent, for in all of them, irrespective of size (6–14 mm. high), the sexual folds are simple, or at most bifid, with no trace of the pinnation so characteristic of *S. pterophylla.* And the margin of the lip is perfectly simple, without crenulations, or folds of any sort. In short, they agree perfectly, in these respects, with the still larger specimens described by A. Agassiz (1865).

Thus the evidence at hand points to the existence of two species of Stomotoca, *atra* and *pterophylla*, closely allied to each other it is true, but sufficiently separated by the simplicity of lip and gonads in the former, contrasted with their complexity in the latter.

STOMOTOCA PTEROPHYLLA Haeckel.

Stomotoca pterophylla Haeckel, 1879, p. 52, taf. 4, fig. 10; Mayer, 1910, p. 113, pl. 29, fig. 3–5, pl. 30, fig. 7; Bigelow, 1917, p. 306.

Stomotoca divisa Maas, 1897, p. 11, taf. 1, fig. 1–9; Bigelow, 1909a, p. 203, pl. 7, fig. 9; pl. 43, fig. 6–7.

Stomotoca atra (*partim*) Vanhöffen, 1913a, p. 14; (*non Stomotoca atra* A. Agassiz, 1865; Mayer, 1910; Hartlaub, 1913).

Station							
10,200	surface	2	spec.	11	mm.	in	diameter
10,202	"	1	"	10	"	"	"
10,202	450–0 meters	1	"	9	"	"	"
10,203	surface	1	"	14	"	"	"
10,205	"	1	"	9	"	"	"
10,211	"	1	"	12	"	"	"

These specimens agree so closely, in general appearance, with earlier descriptions (Bigelow, 1909a; Mayer, 1910), that no further account, beyond what has been given above, is needed.

PANDEA Lesson, 1843.

Hartlaub (1913), in his recent revision of the Pandeidae admits to this genus only one species, *P. conica,* of the five grouped there by Mayer (1910), adding thereto *P. rubra* Bigelow (1913). This reduction results partly from the fact that at least one of Mayer's Pandeas is an Aglantha, and one a Sarsia; partly from the limitation of the genus to pandeids in which the gonads form a net-work, which excludes *P. violacea* Mayer. I too, formerly classed the latter as a Pandea (1909a) in describing specimens from the west coast of Mexico, defining Pandea as "Tiaridae with horseshoe-shaped gonads" (1909a, p. 205). But as Hartlaub (1913) and Vanhöffen (1911) have pointed out, the gonads of the type-species, *conica*, form a net-work; a type of sexual development shared by the mesoplanktonic *Pandea rubra* recently described (Bigelow, 1913, p. 14). And inasmuch as the structure of the gonad has proved to be a very useful taxonomic character, in fact the only trustworthy one, among the polytentacular pandeids, it is wisest to follow Hartlaub in his limitation of the genus, referring the *Pandea violacea* of Mayer (1910) and Bigelow (1909a) in which the gonads are smooth, to the new genus Merga, established by Hartlaub (1913, p. 249) expressly for it. To Merga likewise belongs the *Pandea sp.* of Lo Bianco (1903), for though Hartlaub (1913, p. 250) thought it deserved a separate genus, Mergintha, the only character separating it from Merga, its folded lip, is not of more than specific value. This leaves *P. conica* Quoy and Gaimard, and *P. rubra*, Bigelow as the sole representatives of Pandea. *Pandea rubra* is separable from *P. conica* by its large size, deep red pigmentation, extremely complex gonad-net, and by the absence of the exumbral nettle ribs so characteristic of *P. conica*.

Pandea conica (Quoy and Gaimard).

Dianea conica Quoy & Gaimard, 1827, p. 182, pl. 6A; fig. 3, 4. (For synonymy, see Mayer, 1910, p. 118; Hartlaub, 1913, p. 338).

Station 10,171, 75–0 meters, 1 contracted specimen, 9 mm. high by 9 mm. broad.

This specimen is undoubtedly a Pandea; and in its main features resembles *P. conica* so far as can be seen in its present imperfect and distorted state. But it is with some hesitation that I refer it to that species, because of the minor differences enumerated below. A larger series might show that it represents a new, though allied, species.

In its general form; in the net-like structure of its gonads; in the presence of well-developed "mesenteries" involving all but the oral end of the gastric wall; in the smooth walled radial canals; the occurrence of exumbral nettle-ribs, one to each tentacle; the structure of the tentacular bulbs; the presence of abaxial ocelli; and in pigmentation, it agrees with the descriptions of *P. conica* by Haeckel, (1879), Mayer (1910), and Hartlaub (1913). But the manubrium, filling the upper half of the bell-cavity, is larger than figured by them for *P. conica*, or than in two excellent Mediterranean specimens of that species with which I have compared it. And there are more tentacles, *i. e.*, 34, instead of 24 or less, as seems to be the rule in *P. conica* from the Mediterranean. The apical gelatinous thickening, so characteristic of *P. conica*, is apparently wanting here; though owing to the condition of the specimen, this apparent difference can not be relied on. And, for the same reason, it is best to place no dependence on the apparent limitation of the nettle-ribs to the lower $\frac{1}{3}$ of the exumbrella surface, the latter being much damaged.

Preserved in formalin, manubrium and tentacular bulbs are pale ochre-yellow, ocelli yellowish brown.

EUTIARA, gen. nov.

This genus is proposed for an interesting new pandeid which is allied, in its general structure, to Leuckartiara and Neoturris, but which has well-developed centripetal canals. It may be defined as Pandeidae with blind centripetal canals alternating with the radial canals; with well-developed mesenteries; complex gonads fundamentally of the "Neoturris" type.

EUTIARA MAYERI, sp. nov.

Plate **1**, fig. 1–5; Plate **3**, fig. 6.

Station 10,161, 100–0 meters, 1 specimen, 18 mm. high by 14 mm. broad. TYPE.

Fortunately the single example is in fair condition anatomically, though somewhat crumpled. The bell is dome shaped, thin walled as in Leuckartiara and Neoturris, its cavity deep; and there is no trace of any apical gelatinous thickening, the cavity of the manubrium being domed, corresponding to the outline of the bell, the bell-wall as thin at the apex as elsewhere (Plate **1**, fig. 1). In this it resembles adults of Neoturris (Hartlaub, 1913, p. 331). A striking character of this Medusa is the presence of 8 radial exumbral ribs, one opposite each tentacle, extending from the tentacle-base, with which it is continuous, up over the exumbrella. At first sight they suggest the nematocyst ribs of Pandea, or of Browne's (1916) *Leuckartiara gardineri.* But cross-sections prove that in reality they are canals, with well-developed entodermal layer, not solid ectodermal thickenings. Presumably their lumens connect with those of the tentacles to which they correspond. To my surprise no nematocysts were to be found in them, either on sections, or on surface examination with the microscope. But unfortunately, the histological condition of the specimen was poor, most of the ectoderm being destroyed along these canals, though persisting on the exumbrella flanking it; hence it is best to lay no stress on the absence of nematocysts. Nothing to correspond to these canals has ever been described for any pandeid; but it is possible that the exumbral bands of *Leuckartiara gardineri* are likewise canals in reality. And since, so far as I know, the microscopical structure of the exumbral ribs of Pandea has not been studied, they too, may be hollow. Exumbral canals of this type, though certainly unusual, are fundamentally nothing more than extreme prolongations of the tentacular bulbs, which, in most pandeids, clasp the exumbrella more or less. Browne (1916) surmises that the exumbral bands of *Leuckartiara gardineri* are brilliantly colored in life: after preservation, however, they are colorless in our specimen of Eutiara. The canals opposite the radial tentacles extend upward almost to the apex of the bell, the interradials only to about its mid-level, (Plate **1**, fig. 1); their unequal lengths suggesting that they, like the two series of tentacles, radial and interradial, are developed successively.

Manubrium. The manubrium is large, hanging slightly below the mid-level of the bell-cavity, its capacious cavity domed above, as already noted, the mouth wide open, the lip apparently crenulated, but too much torn for accurate description. The so-called "mesenteries," which are in reality nothing but the expanded bases of the radial canals, are well developed, the lines of union between canal and manubrium extending over practically the whole length of the latter, from lip to apex, the four slit-like openings of the canals almost completely subdividing the walls of the manubrium along the perradii (Plate **1**, fig. 2). The general structure of these "mesenteries" is already well known for Leuckartiara (Hartlaub, 1913); what is interesting here is the high degree to which they are developed.

Gonads. The sexual folds (Plate **1**, fig. 2) are reducible to the Neoturris type (Maas, 1904b; Bigelow, 1909a; Hartlaub, 1913), there being two series of adradial folds in each quadrant of the gastric wall, which are not confluent at their interradial end as in Leuckartiara, but independent of one another (the distinction between these two gonad types has recently been discussed in detail by Hartlaub, 1913). In Eutiara, as in Neoturris, the four broad interradial zones, although bare of folds, except near the upper end of the manubrium where the two series in each quadrant approach each other, bear sexual products in irregular pockets. And though these are much fewer, 2 or 3 in each quadrant, than in Neoturris, it is possible that they may increase in number with the continued growth of the Medusa; especially since the thinness of the gastric wall, even in the region of the sexual folds, shows that the specimen is immature.

Canal-system. The radial canals are very broad; next the ring-canal their margins are simply more or less wavy: but above $\frac{1}{3}$ of the bell-height their margins bear numerous long diverticula (Plate **1**, fig. 1), some of them simple, others dendritically branched, with short, blunt terminal lobes, which are largest at, and slightly above, the lower edge of the slit-like gastric openings of the canals. The margin of the ring-canal, itself as broad and flat as the radials, is smooth except for 1–3 very small triangular spurs per quadrant. The four interradial centripetal canals, mentioned above as the most characteristic feature of the genus, are as broad as the radials, and reach to about $\frac{1}{3}$ of the bell-height, where they end blindly (Plate **1**, fig. 1). Their margins are wavy, with a few short, blunt, lateral, and terminal diverticula at their upper ends, corresponding, in size, to the small diverticula from the radial canals at the same level. And one of them bears two short, pointed spurs, at its junction with the ring-canal, similar in outline to the spurs of the latter.

Tentacles. There is a large tentacle opposite every canal, radial, or centripetal, *i. e.*, eight in all; the basal bulbs are large, triangular, laterally compressed; they clasp the exumbrella (Plate **1**, fig. 3) and their outer corners are continuous with the exumbral bands already described. Such of the tentacular filaments as I was able to disentangle are about three times as long as the bell is high: their tips are all destroyed. There are no tentacular ostia on the basal bulbs, such as occur in *Neoturris fontata* (Bigelow, 1909a, p. 209). The margin between the tentacles bears a series of small rounded, rudimentary tentacular bulbs, without filaments, none of which show any signs of later developing into tentacles; their number per octant is 8, 6, 5, 9, 7, 7, 9, 8, a total of 59. In their permanently rudimentary condition Eutiara agrees with *Leuckartiara gardineri* Browne (1916).

Ocelli. No ocelli, or pigment-clusters, are to be seen on the bases of the eight large tentacles. But most of the rudimentary knobs bear abaxial pigment-spots near their tips (Plate **1**, fig. 4): and the few which lack them may have lost them through damage in capture or preservation.

Color. After preservation in formalin, manubrium, large tentacular bulbs, and the pigment-spots, or ocelli, on the rudimentary tentacular bulbs, are yellowish brown.

BYTHOTIARIDAE Maas.

CALYCOPSIS Fewkes, 1882.

(*Sibogita* Maas, 1905).

The species described below bridges the gap between Calycopsis and Sibogita. According to Vanhöffen (1911, p. 214) these two genera are separated by the fact that in Sibogita the centripetal canals unite with the radials, or with each other, whereas in Calycopsis they are either permanently blind, or join the cruciform base of the manubrium; a view accepted, though with reserve, by Hartlaub (1913), and tacitly, by me in an earlier paper (1913). But it is obvious that this difference is a minor one, centripetal canals joining radials, or manubrium, according to their location on the subumbrella. And as some of the centripetal canals in one of the specimens described below join the former, some the latter, some of its quadrants would belong to one genus, others to the other, were both to be recognized.

Eight "species" of Calycopsis, as here defined, have been described from the deep-sea expeditions of recent years: *C. typa* Fewkes (incl. *C. nauarchus* Bigelow, 1909b); *C. geometrica* Maas (1905); *C. simulans* Bigelow (1909a); *C. borchgrevinki* Browne (1910); *C. chuni* and *C. bigelowi* Vanhöffen (1911); *C. nematophora* Bigelow (1913); *C. valdiviae* Hartlaub (1913): the relationships, of most of these, I have discussed elsewhere (1913, p. 21). *Calycopsis typa*, *C. simulans*, *C. chuni*, and *C. borchgrevinki* are closely allied to one another structurally; being separated only by such minor characters as relative number of canals and tentacles; presence or absence of an apical depression; and regularity of the sexual folds. And it is possible that the last may be a young stage of one of the others (1913, p. 22). *Calycopsis geometrica* is, however, sharply marked off from the others by the union of the centripetal canals with the radials, instead of with the manubrium; *C. nematophora* by its labial nemotocyst knobs, and by the structure of its gonads; *C. valdiviae*, founded by Hartlaub for the specimens recorded by Vanhöffen (1911, 1912) as *C. typa*, by the fact that the radial canals, in their union with the manubrium, show no trace of the enlargements, or so called "mesenteries" characteristic of other species of Calycopsis (Hartlaub, 1913, p. 347). And it is further characterized by the prickly, or warty, nature of the marginal lobes of the exumbrella between the tentacles (Vanhöffen, 1912b, p. 364). The series of Calycopsis in the present collection has similar exumbrella sculpture, in the form of rows of high, conical, gelatinous prominences, on the marginal lobes. And as nothing comparable occurs in any Calycopsis which I have seen, either in life or after preservation (1909a, 1909b, 1913, 1917), or is recorded, except for *C. valdiviae*, it separates the new species, *C. papillata*, from all members of the genus, except the latter. It is sufficiently distinguished from *C. valdiviae* by the presence of well-developed "mesenteries"; by the small number of centripetal canals, and especially by the fact that some of the latter join the manubrium, some the radials (p. 377); in fact, this character alone would separate it from all specimens of the genus yet described. But it is by no means impossible that a similar type of canal-union may take place in other species, though it has not actually been observed. *Calycopsis papillata* is further distinguished from its relatives as follows: — from *C. nematophora*, by the smooth lip; by equal numbers of tentacles and canals; from *C. borchgrevinki*, *C. bigelowi*, and *C. chuni*, by equal numbers of canals and tentacles; from *C. typa*, by much smaller manubrium, narrow sexual folds, and small number of canals and tentacles; from *C. geometrica*, by small number of tentacles and canals.

Calycopsis papillata, sp. nov.

Plate **2**, fig. 1–7; Plate **3**, fig. 1.

Station			
10,206,	75–0 meters,	1 spec.	27 mm. high by 26 mm. broad. Type.
10,196,	surface	2 "	respectively, 18 mm. broad by 18 mm. high, and 11 mm. by 11 mm.

All are in good condition.

In all these specimens the bell is dome shaped, the gelatinous substance thick and notably rigid, with the deep bell-cavity characteristic of this genus (Plate **3**, fig. 1). The type, and the 18 mm. specimen, are both somewhat flattened laterally, but inasmuch as the compression is interradial in the former, radial in the latter, while the small specimen is not flattened at all, the flattening is apparently no more significant in this species than it is in *C. typa*, or in *C. nematophora* (1909b, 1913), where it is either a temporary contraction phase, or the result of preservation. In all three specimens the apex of the bell is rounded, with no trace of the funnel-shaped apical depression, so characteristic of *C. typa* (Bigelow, 1909b, fig. 1).

It is characteristic of Calycopsis that the tentacular roots lie in furrows of the exumbrella. And these are much deeper in *C. papillata* (Plate **2**, fig. 2) than in any other specimens of the genus which I have studied (1909b, fig. 1; 1909a, pl. 43, fig. 2; 1913, pl. 3, fig. 1), the gelatinous substance between every two tentacles forming a well-marked lobe, or ridge, which projects downward below the margin in a manner better illustrated by Plate **2**, fig. 2, 3 than verbally. And it is the distal extremities of these ridges, below the level of the bell-margin, that bear the gelatinous papillae which are one distinctive feature of the species. These are conical in outline, rigid in substance, situated in 1–3 irregular rows on each marginal lobe, the number, in four successive lobes of the type-specimen, being 9, 11, 6, 7. In the 18 mm. specimen, they are equally unmistakable, though fewer in number (4–6 per marginal lobe), and the lobes themselves smaller. In the smallest specimen most of the lobes bear at least one papilla, though two are smooth. And even thus early the lobes themselves are as large as the corresponding structures in adults of other species of Calycopsis.

Manubrium. The manubrium is much smaller in *C. papillata* than in Atlantic specimens of *C. typa* (Bigelow, 1909b, fig. 1); or in *C. nematophora* (Bigelow, 1913, pl. 2, fig. 8), being only about 5 mm. long in the type, in which it is slightly contracted, contrasted with a length of 13–15 mm. in *C. typa* of corresponding size. It is 4 and 2 mm. long, respectively, in the two smaller specimens. And as it is correspondingly narrow, it gives the Medusa an aspect very different from that of *C. typa* (incl. *C. navarchus*).

In the type-specimen the lip is irregularly folded; in the two smaller ones circular; and in all three its margin is smooth, without any trace of the labial nematocyst knobs which characterize *C. nematophora.* The gonads (Plate **2**, fig. 4) much resemble those of *C. typa,* there being two rows of narrow, regular genital folds in each interradius, alternating with smooth zones in the perradii where no sexual tissue is developed. But the irregular sexual lobes seen in *C. typa* do not occur in our specimens of *C. papillata*, nor is there any trace of the irregular net-work which characterizes the mid-line of each interradius in *C. nematophora.* The genital folds are nearly as well developed, with

14–16 rows in each series, in the medium sized specimen as in the type, in which many large eggs are clearly visible (Plate 2, fig. 4), and equally regular, and precise in their arrangement, though it is impossible to determine the sex from surface views. In the smallest specimen the gonads are represented by double rows, each of 14–15 small, oval thickenings in each interradius of the flask-shaped manubrium.

Canal-system. As pointed out (p. 377) the canal-system of this species shows that no sharp line can be drawn between Calycopsis and Sibogita. In the smallest specimen, besides the four radial canals, there are eight centripetals, all ending blindly at about $\frac{3}{4}$ of the bell-height (Plate 2, fig. 7), and varying only slightly in length. And the same number of canals is to be seen in the medium sized specimen. But corresponding to the increase in bell-height from 11 to 18 mm. (Plate 2, fig. 5), the centripetal canals are proportionally longer, reaching nearly to the apex of the bell-cavity, though all of them are still blind. In the type-specimen, as already noted, two of the centripetal canals are still blind; but of the remaining six, three have joined the cruciform base of the manubrium; two join radial canals close to their bases, and one joins a radial canal at a considerable distance from the manubrium (Plate 2, fig. 1). Likewise, there are four very short centripetal canals alternating with the large ones, such as I have described for *C. typa* (1909b, p. 207, fig. 6, 7); and one of the latter has a transverse branch nearly reaching the canal next adjacent, suggesting such a union as occasionally takes place in *C. nematophora* (1913, p. 24, pl. 2, fig. 8). In *C. papillata* as in *C. typa* and *C. nematophora,* the four radial canals dilate just below their union with the manubrium, to form the so-called "mesenteries" on the taxonomic value of which Hartlaub (1913) has laid stress. But no trace is to be seen of subumbral muscle-bands such as flank the canals in *C. nematophora.*

Tentacles. There are twelve tentacles in every specimen; a tentacle opposite every canal in the two smaller ones. In the type there is a tentacle opposite each radial and each large centripetal canal, but none opposite the small centripetals. Structurally the tentacles are of the usual calycopsid type, the bases turned outward against the exumbrella, so that they appear to arise some distance above the margin, then bending sharply downward. In the smallest specimen several of the tentacles bear spherical terminal knobs, such as characterize *C. nematophora.* But, as, unfortunately, the tips of all the tentacles of the two larger specimens have been destroyed, it is doubtful whether the knobs are permanently spherical, or whether, with growth, they assume the oval outline seen in *C. typa.*

Color. In the two larger specimens (preserved in formalin), the manubrium is pale reddish yellow. But experience has shown that this gives little idea of its color in life.

The localities of capture, Straits of Florida and N. E. Providence Channel, add a link to the chain of evidence that Calycopsis is a neritic form, though probably the hydroid stage of most of its members is passed in deep water. Were this not so, we might expect to find Calycopsis generally distributed over the high seas, like most holoplanktonic coelenterates, for the range of the genus extends from the Arctic to the Antarctic, and to all three great oceans. But most of the records so far obtained suggest just the contrary, being near land. Thus *C. typa* (*sens. str;* p. 277) is only known along the continental shelf between Cape Cod and Chesapeake Bay; *C. nematophora* from the Sea of Okhotsk and Bering Sea; *C. borchgrevinki* from the shores of the Antarctic continent; *C. geometrica* from Malaysia; *C. simulans* between the Galapagos Islands and Central America; *C. bigelowi* from the Gulf of Aden; *C. chuni* from the Gulf of Aden and the neighborhood of Cape Gardafui. *Calycopsis valdiviae* alone, has been taken far from any coast-line, *i. e.* off Liberia (0° 12′ N.; 16° 39′ W.), and in the Indian Ocean off Bourbon; its other captures are from the Alguhlas current off South Africa, and near the Cape Verde Islands (Vanhöffen, 1911, 1912a, "*S. typa*").

HETEROTIARA Maas, 1905.

The two known species of Heterotiara, *H. anonyma* Maas (1905), large (15–25 mm. high) but with only 12 tentacles at most, and *H. minor* Vanhöffen, small (10 mm. high), but with 20 or more tentacles, have been so fully discussed by Vanhöffen (1911), by Hartlaub (1913) and by me (1913) that no comment would be needed here had not Browne (1916) recently suggested that the specimens from off the coast of Peru referred by me (1909a) to *H. anonyma* really did not belong to Heterotiara at all but to some other genus. This supposition is based on the absence in these Peruvian specimens, of the terminal tentacular knobs which have since proved to be characteristic both of *H. anonyma* and *H. minor.* But since their tentacles were obviously imperfect, and they agree otherwise with several excellent specimens from the northwestern Pacific and Bering Sea (1913, p. 25) and with the present series, I am convinced that they were *H. anonyma*, the apparent absence of terminal tentacular knobs being merely an evidence of mutilation.

HETEROTIARA ANONYMA Maas.

Heterotiara anonyma Maas, 1905, p. 19, pl. 3, fig. 19–21; Bigelow, 1909a, p. 216, pl. 41, fig. 12, 13; 1913, p. 25; Vanhöffen, 1911, p. 211, pl. 22, fig. 3, 4; Hartlaub, 1913, p. 350.

The collection contains the following series: —

Station	Depth meters	Height mm.	Diameter mm.	Tentacles
10,208	100–0	11	7.5	9
10,200	surface	9	6	11
10,205	100–0	9	7	11
10,205	100–0	9	7	10, + 5 knobs
10,205	100–0	7	5	7, + 1 small
10,205	100–0	7	?	8
10,200	75–0	13	9	11

Also two much contracted specimens from Station 10,200, 75–0 meters, and one from Station 10,203, 75–0 meters.

These specimens add nothing of importance to my earlier (1913) account, except for the presence of young tentacles in two of them; something never before observed in this species (1913, p. 26). Did all these young tentacles develop, a total of fifteen would result for one of the BACHE specimens; but the maximum number of fully developed tentacles so far counted in any *H. anonyma* is twelve.

In the BACHE, as in the northwest Pacific specimens, the surface of the high arched bell is smooth, with no trace of the four interradial folds noted by Maas (1905). And as these do not appear in any specimen recorded since the species was first described, they were probably a contraction-phenomenon.

All tentacles that are intact bear spherical terminal knobs. In all the present series the manubrium is so strongly contracted that no account of the gonads is possible.

The most interesting feature about this series is its Atlantic origin, all previous records for the genus being from the Pacific Ocean, the Indian Ocean, or seas tributary to them.

LEPTOMEDUSAE.

MELICERTIDAE Mayer.

(*Sensu em.*)

CYCLOCANNA, gen. nov.

This new genus is proposed for a new leptomedusid, without otocysts or other marginal sense-organs, but with two kinds of tentacles, large and small, and in which the radial canals perform a peculiar S-like curve, in their course from manubrium to margin.

That this new Medusa belongs to the Leptomedusae is sufficiently established by the location of the gonads on the radial canals (distinguishing it from the Anthomedusae), and by its hollow tentacles, which separate it from all Trachomedusae except the aberrant fresh-water Limnocnida. But its family relationship must remain more or less doubtful until it is definitely known whether the absence of otocysts (p. 385) is normal, or accidental. Under the former supposition, which is the more probable (p. 386), it must fall nearest the simply organized Leptomedusae recently grouped by Mayer (1910) under Thaumantias,[1] being separated from the Laodiceidae (Browne, 1907) by the absence of cordyli; from Melicertum by the number of canals; and from the various other genera in which neither otocysts nor cordyli are present, the Polyorchinae and Berenicinae of Mayer (1910), by its simple canals.

According to Mayer's (1910) scheme Cyclocanna would then fall in the subfamily Melicertinae of his Thaumantidae. But there is a serious objection to his system, in the fact that, being based wholly on the simplicity, or style of branching, of the radial canals, it groups together genera with, and genera without marginal cordyli, organs which, as Browne (1907) has pointed out, are probably more significant, phylogenetically, than is the precise character of the radial canals.

Since the location of Cyclocanna in this general section of the Leptomedusae depends on a character (absence of otocysts) yet to be definitely established, it is useless to discuss the matter here, further than to point out that if it actually lacks otocysts, it, together with the

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[1] Poche (1914, p. 73) points out that the name can not be used in this sense because the type-species *T. hemispherica* Eschscholtz 1829 was undoubtedly a Phialidium (Browne, 1896, p. 482; Mayer, 1910, p. 198).

"Thaumantias" of Mayer, and Melicertum, form a natural family, distinguished from all other Leptomedusae by having neither otocysts nor cordyli, and by the simple radial canals. The name Melicertidae is available for it, though in a narrower sense than Mayer (1910, p. 197, "Melicertinae") has used it.

Should Cyclocanna prove to have otocysts, it would fall, without difficulty, into the Eucopidae. In any case, it is easily separable from all known Leptomedusae by the peculiar course of the radial canals. The depth and method of its capture, as well as dark pigmentation of its manubrium, suggests that it belongs to the ever growing list of Medusae whose habitat is the intermediate depths, not at the surface.

CYCLOCANNA WELSHI, sp. nov.

Plate **3**, fig. 2–5.

GRAMPUS Station 10,385, 37° 28′ N. Lat., 74° 25′ W. Long., August 13, 1916, 140–0 meters, 2 specimens, 68 mm. (TYPE), and 49 mm. in diameter.

This Medusa is so peculiar in appearance, owing to its canals, and deeply pigmented manubrium, that it can not be confused with any other species.

In both specimens the bell is of the typical leptomedusan form, saucer shaped, with shallow cavity, the gelatinous substance moderately thick near the center, diminishing toward the margin. Both exumbrella and subumbrella surfaces are smooth (Plate **3**, fig. 2).

The course of the radial canals affords the most distinctive feature of the genus. These arise from the apex of the manubrium in the usual manner, and are not branched; but instead of running direct to the margin, as is the common rule among Medusae with simple canals, they follow a peculiar S-curve, bending sharply to the left, *i. e.*, anti-clockwise, at about the mid-breadth of the bell, thence running roughly parallel to the margin, almost to the line of the neighboring perradius, where they once more turn toward the margin (Plate **3**, fig. 2). In the type-specimen the outer angle of each canal is close to the inner angle of its next neighbor; but apparently this extreme condition is not attained till maturity, for in the smaller specimen the junction of the radial canals with the circular canal takes place, roughly, in the interradii, though the canals are looped on the same plan as in the type.

Both radial and circular canals are narrow and smooth walled, as in most Leptomedusae.

Gonads. The gonads occupy the major portion of the radial canals, leaving only their proximal and distal ends bare. Each consists of a single, broad, thin lamella, a simple dilation of the canal, thrown into a complicated series of alternating transverse folds (Plate **3**, fig. 3).

The type is a sexually mature female, large eggs being plainly visible. The other specimen is apparently a male, and its gonads are smaller and simpler, corresponding to its smaller size.

Manubrium. The manubrium is voluminous, hanging to, or perhaps below, the opening of the bell, somewhat cruciform in cross-section, the radial canals traceable to the center over its aboral surface. It is squarish in outline, without any clear morphological division into basic, gastric, and labial portions. In both specimens it is more or less twisted, and longitudinally wrinkled and folded in the interradii. But since these folds follow no definite plan, but vary from quadrant to quadrant, they may safely be classed as contraction phenomena. Along the perradii the walls of the manubrium are smooth (Plate **3**, fig. 3). The mouth is wide-open, as broad, in both specimens as the greatest diameter of the manubrium, and surrounded by a simple lip. But although the latter has no distinct lobes, or radial prolongations, its margin bears a series of small folds, and crenulations (Plate **3**, fig. 3).

Marginal organs. There are four large radial tentacles with much swollen bases (Plate **3**, fig. 2). And though all but the bases of these have been destroyed in all cases, enough remains to show that they are hollow. Between these the margin bears a considerable number of very small papilliform tentacles, without filaments (Plate **3**, fig. 4). And fortunately many of them are in such good condition that I can safely assert that their present rudimentary condition is normal, not the result of mutilation. They, too, are hollow, as is clearly visible, when torn or broken. They are of various sizes, the presence of several very small ones in the type showing that interpolation of new ones takes place right up to maturity. But the larger ones are extremely uniform in length, and there is nothing to suggest that they ever develop into large tentacles.

In the only quadrant wholly intact (type) there are twenty-three small tentacles, suggesting a total of 80–90. In the smaller specimen there are about twenty in one quadrant.

A careful search with the compound microscope has failed to reveal any otocysts, and as portions of the margins of both specimens are in good condition, it is probably safe to say that such organs are lacking. But otocysts are so easily destroyed that the possibility that they were present but have been lost, must be recognized. This is not true of the solid marginal clubs, or cordyli, characteristic of the Laodiceidae, which are equally wanting in Cyclocanna. I should emphasize the fact that the small marginal organs of this genus are true, hollow tentacles, though they somewhat resemble cordyli in general appearance. There are no true ocelli.

Color. The pigmentation of Cyclocanna is extremely characteristic and striking, the interradial walls of the manubrium, except for lip and immediate basal portion, being very dark gray, almost black, and extremely opaque, the result of great numbers of minute black pigment-granules crowded together in the ectoderm (Plate 3, fig. 2, 3). These granules occur along the perradii as well, but in such small numbers as to be hardly appreciable there, the result being that the perradii are extremely conspicuous, as white bands on the dark manubrium. The lip too, and the immediate base of the manubrium are likewise colorless, though opaque, at least in the preserved state. And this is also true of the inner, endodermal gastric wall. Black pigment-granules likewise occur in such numbers in the ectoderm of the oral sides of the small tentacles that these organs, are dark gray, often nearly black, in oral view. And though the pigmentation is not sharply defined, the granules spreading in small numbers out over the neighboring parts of the marginal thickenings from the tentacles (Plate 3, fig. 5), they are confined to the immediate neighborhood of the latter, the intervals between the tentacles, as well as the neighboring velum, being colorless. Black pigment is likewise present on the oral side of the bases of the large radial tentacles, but these are in such poor condition that its extent is doubtful. Pigmentation is confined to the oral, (axial), surfaces of the marginal organs, the aboral, (abaxial), surfaces being colorless. The gonads of both specimens are still salmon-pink after two months in formalin.

LAODICEIDAE L. Agassiz.

(*Sensu* Brown, 1907).

LAODICEA Lesson, 1843.

(*Sensu em.* Browne, 1907; Bigelow 1909a).

LAODICEA CRUCIATA (Forskål).

Medusa cruciata Forskål, 1775, p. 110; 1776, taf. 33, fig. 8.
Laodicea cruciata L. Agassiz, 1862, p. 350.
(For synonymy, see Mayer, 1910, p. 201).

As Mayer points out, the identity of the *Medusa cruciata* Forskål with *Laodicea cruciata* L. Agassiz and later authors (= *Thaumantias mediterranea* Gengenbaur 1856, and *Thaumantias undulata* Forbes and Goodsir 1853), is doubtful. But at least there is nothing in Forskål's figure to forbid it, and it will tend toward stability of nomenclature to use *L. cruciata,* referring it, however, to Forskål, not to L. Agassiz.

The BACHE collection contains a single specimen of this common and well-known species, which adds nothing to previous accounts.

Station 10,206, surface, 1 specimen.

EUCOPIDAE Gegenbaur.

AEQUOREA AEQUOREA (Forskål).

Medusa aequorea Forskål, 1775, p. 110; 1776, pl. 32.
(For synonymy, see Mayer, 1910, p. 325, and Bigelow, 1913, p. 38).

Station 10,161, surface, 1 very fragmentary specimen, 60 mm. in diameter.

This specimen, undoubtedly an Aequorea, apparently belongs here, but is too imperfect to add anything to previous accounts.

TRACHOMEDUSAE.

TRACHYNEMIDAE Gegenbaur.

AGLAURA HEMISTOMA Péron and Lesueur.

Aglaura hemistoma Peron & Lesueur, 1809, p. 351.
(For synonymy, see Bigelow, 1909a, p. 119, and Browne, 1916, p. 196).

Station		
10,161	surface,	7 specimens.
10,166	100–0 meters,	2 specimens.

These few specimens add nothing to previous accounts. The most interesting fact is that this species, found in such abundance by most expeditions to warm seas, should have been so rare in the region traversed by the BACHE.

AGLANTHA Haeckel, 1879.

Vanhöffen (1913) has recently united this genus with Aglaura: but though the two are close allies, and each contains at most but one or two species, the difference in the location of the gonads (at the extremity of the peduncle in Aglaura, on the subumbrella near the base of the peduncle in Aglantha), seems sufficiently important to warrant the retention of Aglantha. The impossibility of distinguishing two species in this genus, based on the number of otocysts, has now been fully demonstrated by Vanhöffen (1912a), by Mayer (1910), and by my own studies on a large series of specimens of all sizes from northern waters, both Atlantic and Pacific (1909c; 1913). All belong to *A. digitale.*

AGLANTHA DIGITALE (Fabricius).

Medusa digitale Fabricius, 1780, p. 366.
(For synonymy, see Mayer, 1910, p. 402).

Station		
10,157	18–0 meters,	5 fragmentary specimens all about 10 mm. high.
10,158	600–0 meters,	1 fragmentary specimen, 10 mm. high.

None of the specimens are in good enough condition to show the otocysts, but all have gonads, in spite of their small size. They are interesting chiefly for the record of occurrence.

RHOPALONEMA VELATUM Gegenbaur.

Rhopalonema velatum Gegenbaur, 1856, p. 251, pl. 9, p. 1–5.
(For synonymy, see Bigelow, 1909a, p. 129).

This species was taken at Stations 10,161, 10,162, 10,166, 10,169, 10,171, 10,173, 10,176, 10,178, 10,180, 10,182, 10,188, 10,192, 10,195, 10,196, 10,200, 10,202, 10,203, 10,206, 10,208, 10,209, 10,211, 10,212, in hauls varying from the surface to 1,000–0 meters.

Most of the specimens are fragmentary, having lost tentacles and otocysts. But the length, at least, of the gonads can usually be traced, even when the organs themselves are destroyed. And this, together with the number (8) of canals, the characteristic outline and especially the apical thickening, or top-knot, which is intact in all, serve to identify them as *R. velatum.* Vanhöffen (1902) and I (1909a) have already given reasons for the belief that this is likewise true of all Rhopalonemas, except the recently discovered *R. funerarium* of the mid-depths. Browne (1916), on the contrary, believes that the specimens described by him (1906) from the Bay of Biscay, as *R. coeruleum,* represent a separate species, a view, based on the length of the gonads, which occupy the middle $\frac{1}{3}$ of the radial canals, the specimens agreeing in all other respects with *R. velatum.* But this difference does not seem sufficient to separate them from *R. velatum* for there is considerable variation in the length of the gonads in the latter, the condition described by Browne falling well within the extremes.

Geryonidae Eschscholtz.

Liriope Lesson, 1843.

The few imperfect specimens listed below do not add anything to my previous discussions of the genus (1909a, 1913). The shape of the gonads is now generally accepted as the most important character in Liriope (Vanhöffen, 1902, Maas, 1905, 1909, Bigelow, 1909a, Browne, 1916); and the form with primarily triangular gonads is usually designated as *L. tetraphylla.* The various races with oval gonads are in such urgent need of revision, that I (1909a, p. 115) have hesitated to identify such specimens; Browne (1916) does likewise.

Liriope tetraphylla (Chamisso and Eysenhardt).

Geryonia tetraphylla Chamisso & Eysenhard, 1821, p. 357, pl. 27, fig. 2.
(For synonymy, see Bigelow, 1909a, p. 112; 1913, p. 55).

Station					
10,200	75–0 meters	1 specimen	8 mm.	in	diameter
10,207	100–0 “	1 “	10 mm.	“	“

Both specimens are fragmentary; but their gonads are already triangular, though small.

Liriope scutigera McCrady?

Liriope scutigera McCrady, 1857, p. 106.
(For synonymy, see Mayer, 1910, p. 421).

Five small fragmentary specimens of Liriope, 6–10 mm. in diameter, and obviously immature, with small oval gonads, were taken at Stations 10,202, 10,203, 10,211, 10,212. They are provisionally identified as *L. scutigera,* because their gonads agree with that form (McCrady, 1857, Brooks, 1886).

LIRIOPE species?

Four Liriopes in which the gonads were entirely destroyed were taken at Stations 10,203 and 10,209. Their condition is so poor that it is idle to attempt to identify them.

GERYONIA PROBOSCIDALIS (Forskål).

Medusa proboscidalis Forskål, 1775, p. 108; 1776, pl. 36, fig. 1..
(For synonymy, see Bigelow, 1909a, p. 116).

This well-known species occurred twice, at Station 10,206, where fragments of a large specimen were taken in a haul from 100 meters, and at Station 10,200, surface, 3 specimens so young that the gonads have not appeared.

NARCOMEDUSAE.

The classification of the Narcomedusae has been the subject of much discussion. And while all recent authors agree that Haeckel's (1879) system is unnatural, the revisions proposed by Maas (1904a, 1904b) and adopted, in its essentials by Mayer (1910) and by me (1909a, 1913) differs fundamentally from Vanhöffen's scheme (1908a, 1912a). The characters which have been used to separate, first, families, then genera in this group, are, the presence or absence of gastric pockets, the location of the gastric pockets, radial or interradial, and the presence or absence of a peripheral canal-system. To Maas, and to me, the gastric pockets seem the more important, while Vanhöffen chooses the canal-system, these two systems resulting in widely divergent alignments of genera, and even species. I have already (1909a, p. 48), given reasons for considering the state of the gastric pockets the more significant character, phylogenetically, of the two: they are, in brief that canals may, or may not, be present, in genera obviously closely allied, if not directly related in phylogeny (*e. g.*, Aegina, Solmundella, and Aeginopsis), and even in different species of a genus (*e. g.*, in Cunina): that different genera may exhibit gradations in the degree of development of the canals, and that at least two Narcomedusae (*Cunina proboscidea,* and *Pegantha clara*) have two generations, one with, the other apparently without canals. Which of two characters is the more important in classification is necessarily more or less a matter of opinion: and this is especially true of a group so imperfectly known as the Narcomedusae. What is most needed now is not so much a continued discussion of family relationships, as an attempt to fill in the gaps in our knowledge of the actual genera and species concerned. When these are sufficiently described, and the parentage of the various young Narcomedusae, on which so many species-names have been based, has been determined, a sound phylogenetic classification will follow automatically.

Our knowledge of certain species, and groups of species, of Narcomedusae, already fulfills this requirement; consequently, they are universally recognized, though called, perhaps, by different names, and differently located in classification, by different authors. There are, to begin with, several species with interradial gastric pockets, and with otoporpae,[1] which fall into four genera according as they have two developed and two suppressed tentacles (Solmundella); four developed tentacles (Aegina); four developed and four suppressed tentacles (Aeginopsis); or eight developed tentacles (Aeginura of Maas and Bigelow, Cunoctona of Vanhöffen). And while these four genera are grouped in one family by Maas (1904b) by Mayer (1910), and by me (1909a), in two families by Vanhöffen (1908a), they are universally recognized, with the limits outlined above.

Equally well defined is a species-group without gastric pockets, but with very conspicuous peripheral canals (at least in one generation), and with otoporpae. These are all located in the Solmaridae by Mayer (1910, one genus Pegantha) and by me (p. 394, two genera, Polycolpa and Pegantha): Vanhöffen (1908a) gives them the dignity of a separate family, Peganthidae, with three genera.

It is in the cases of the various Narcomedusae with perradial gastric pockets; and of those with neither pockets nor peripheral canals, that we find the greatest confusion and disagreement. Species with perradial gastric pockets may or may not have a peripheral canal-system, or otoporpae. According to the scheme here followed they form, together, the Cuninidae, with three genera, Cunoctantha and Cunina with otoporpae, Solmissus without otoporpae. The first two are so closely allied (differing only in the number of tentacles) that they may finally be united. But until an intergradation is actually observed, it is wisest to retain both.

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[1] Ectodermic ridges running over the exumbrella, from the otocysts, bearing nematocysts and perhaps with a sensory function.

Cuninidae.

Cunina Eschscholtz.

(*Sensu* Maas (1904a, 1904b); Bigelow (1909a); Mayer (1910)).

Narcomedusae with perradial gastric pockets; with otoporpae; with nine or more tentacles and marginal lappets; with or without peripheral canal-system.

Vanhöffen (1908a) does not recognize this genus, including most of its species in his Aeginidae; an arrangement which I have already criticised (1909a, p. 49), on the ground that it results in the combination of species with per- and with inter-radial gastric pockets. No less than nineteen "species" have, at one time or another, been referred to Cunina, but it is certain that few of them are valid. Mayer (1910) recognizes seven, but one of these, *C. mucilaginosa*, was so vaguely figured and described (Chammisso and Eysenhardt 1821, taf. 30) that it must always remain doubtful whether the original specimens possessed, or lacked, peripheral canals and otoporpae. And one, *C. prolifera*, may prove to be a solmarid, either a Polycolpa or a Pegantha, it being doubtful whether it has any true gastric pockets (Mayer, 1910, p. 480; Vanhöffen, 1908a, p. 65).

Among the five species remaining in Mayer's list, *C. proboscidae* Metchnikoff, is conspicuous for its gelatinous peduncle and long proboscis, and for the fact that its canal-system is degenerate, short lengths of the canals alone being open, as demonstrated by Mayer (1910, p. 476) from serial sections. It is historic because of its remarkable method of reproduction (Metschnikoff, 1886, Woltereck, 1905, Stschelkanowzeff, 1906).

In *C. lativentris* Gegenbaur, likewise, there is a low gelatinous proboscis, as shown in Gegenbaur's figure (1856, taf. 10, fig. 2), a fact I have myself been able to substantiate on two specimens from Naples. But the peronial canal-system is well developed. Vanhöffen it is true says (1908a, p. 66), that *C. lativentris* has no peripheral canals; quoting Metschnikoff (1878) as his authority. But the Hertwigs not only describe well-developed peronial and ring-canals for this species, but illustrate them both on cross-sections and surface views of the margin (1878, p. 15, taf. 1, fig. 1, 2; taf. 10, fig. 4). And inasmuch as they are equally visible on one of the Mediterranean specimens just mentioned, which agrees in general outline, low proboscis, number of tentacles (12), and outlines of gastric pockets, with Gegenbaur's figures, it may be definitely stated that *C. lativentris* has a canal-system.

The Pacific Cunina recently described by me (1909a), as *C. globosa* Eschscholtz, likewise has unmistakable canals; and further resembles *C. lativentris* in its short oval otoporpae (as I have been able to establish by actual comparison), and in lacking nematocyst pads under the bases of the tentacles. But it has no peduncle, and its gastric pockets are square, instead of widening distally, as is characteristic of *C. lativentris*. Eschscholtz's figure (1829, taf. 9, fig. 3) of *C. globosa* is so general that it will always be open to question whether my Pacific specimens actually belong to that species. But it shows the same general outline, and number of tentacles, while he observed about the same number of otocysts (3) per lappet, though without recognizing their nature. And since there is nothing to forbid my reference of the ALBATROSS specimens to *C. globosa*, it will stabilize the nomenclature of the genus to accept it. The type-species is *Cunina globosa*.

Cunina duplicata Maas (1893), so closely resembles *C. lativentris* in general form, in its well-developed peripheral canals, and its short otoporpae, that it may finally prove to belong to that species, from which it differs only in the greater number (16) of tentacles. But only one specimen of *C. duplicata* has been seen.

C. peregrina Bigelow (1909a) is separated from all other species, except *C. proboscidea,* by the absence of peripheral canals: from *C. proboscidea* by the absence of peduncle, by its long tentacles, and by more numerous otocysts (4–8 per lappet). It is the only Cunina represented in the BACHE collection.

CUNINA PEREGRINA Bigelow.

Cunina peregrina Bigelow, 1909a, p. 59, pl. 1, fig. 6; pl. 15, fig. 1, 2, pl. 28, fig. 1–7, pl. 45, fig. 8; Maas, 1909, p. 37, taf. 3, fig. 19; Mayer, 1910, p. 481.

Station									
10,195	100–0 meters	1	spec.	9	mm.	diameter	10	tentacles
10,208	surface	1	"	9	"	"	10	"
10,208	"	1	"	7	"	"	11	"
10,208	"	1	"	6	"	"	13	"

The ALBATROSS specimens from the eastern Pacific (Bigelow, 1909a) ranged from 3–14 mm. in diameter, the number of tentacles from 8–12. The Japanese specimens recorded by Maas (1909) likewise had 8–12 tentacles. The BACHE specimens add nothing, except by way of verification to the earlier accounts. The most characteristic features, which by themselves are sufficient to separate *C. peregrina* from all other species, are the absence of peripheral canals and of peduncle; minor features of diagnostic value are the square marginal lappets, the squarish outline and comparatively great length of the gastric pockets, the large nematocyst pads beneath the bases of the tentacles, and the large number of otocysts (5–8 per lappet).

The BACHE captures are of interest geographically (p. 431), all previous records for *C. peregrina* being from the Pacific.

SOLMARIDAE Haeckel.

(*Sensu.* Maas, 1904b; Bigelow, 1909a; Mayer, 1910).

Narcomedusae without gastric pockets.

PEGANTHA Haeckel, 1879.

Solmaridae with peripheral canal-system (at least in one generation), and with otoporpae; with gonads localized at the edge of the stomach, as numerous as, and in the radii of, the marginal lappets.

As here defined, Pegantha corresponds to the genera Pegantha + Polyxenia + Polycolpa of Vanhöffen (1908a, 1912a, 1912b). According to him these three genera can be separated by the number of tentacles, Pegantha having 8–13, Polyxenia 16–18, Polycolpa 24–30. But specimens of *Pegantha triloba* having recently been found with fourteen and fifteen tentacles (Vanhöffen 1912a, 1912b), there is no longer any justification for separating Polyxenia from Pegantha, at least on this ground. And the supposed gap, in tentacle-number, between Polyxenia and Polycolpa proves to be equally non-existent, for *Pegantha laevis* Bigelow with 19–22 tentacles when mature (1909a, p. 97) is exactly intermediate between them. The number of tentacles is, at most, only a specific character here; and even so, must be used with caution, being variable in every peganthid yet described.

But it does not follow that all Solmaridae with peripheral canals and otoporpae should be united in one genus, for they fall into two groups, according as the sexual products are localized in pockets at the margin of the stomach, as numerous as, and in the radii of, the marginal lappets (Pegantha), or form a continuous ring in the lower gastric wall, as Haeckel describes them for his genus Polycolpa. And a typical Polycolpa, *i. e.*, solmarid with ring-like gonad, and with canals and otoporpae, has recently been recorded from the Indian Ocean by Browne (1916) as "Solmaris sp.?"

In short, the Solmaridae fall naturally into three genera, Solmaris with ring-gonad, and neither canals nor otoporpae, Pegantha and Polycolpa limited as above, though Mayer (1910), uses the genus Pegantha to include all solmarids with localized interradial gonads, irrespective of the presence or absence of peripheral canals or otoporpae.

In no genus of Medusae is the delimitation of the various species more difficult than in Pegantha, owing to the unsatisfactory nature of most of the older descriptions and figures; and to the paucity and poor condition of available specimens. And it is so homogeneous that for specific characters we must turn to such minor features as the form of the gonads, the number of otocysts, exumbrella sculpture, and number of tentacles with due regard to its variability.

On this basis Vanhöffen (1908a, p. 67) reduces the eighteen species listed by Haeckel (1879) to ten, while Mayer (1910) recognizes eleven. But when the various Peganthas are better known, a much more drastic revision will probably be necessary. This it would be idle for me to attempt, without larger series of specimens than are at hand. But it may be of service to outline briefly the present state of our knowledge.

One species of Pegantha, and one only, *P. triloba* Haeckel, has been taken often enough, and studied sufficiently (1909a, Vanhöffen, 1908a, 1912a, 1912b) to make its specific features, and their variability, well known.

It is characterized by well-marked exumbrella sculpture; by long ovate marginal lappets, tripartite gonads, with occasional bipartite and quadripartite variations, 9–16 tentacles, and 18–20 otocysts per lappet. *P. biloba* Haeckel, with bipartite, and *P. sieboldi* and *P. quadriloba* Haeckel with quadripartite gonads, are probably identical with it (Bigelow 1909a); and the Pegantha described by Vanhöffen (1908a) as *Polyxenia cyanogramma* Quoy and Gaimard, certainly is, as Mayer (1910) has already pointed out. *Pegantha pantheon* Haeckel (1881) resembles *P. triloba* in general form and sculpture, and is separable from it only by having eighteen instead of sixteen, or fewer, tentacles, a distinction which may be merely an evidence of extreme variation. Vanhöffen (1908a, p. 67) it is true, credits it with "Funf-Teiligen Gonaden." But Haeckel's figures of the gonad show merely a much wrinkled sac, as might be expected of alcoholic material.

Pegantha martagon Haeckel has likewise been redescribed recently

(Bigelow, 1909a, p. 83). It, like *P. triloba*, has comparatively few tentacles (9–13) and a high-arched bell; but it is separated from that species by the limitation of the exumbrella-sculpture to the marginal lappets, and especially by the structure of the gonads, which are simple in the young, and though more or less lobed and irregular in the adult (Bigelow, 1904, pl. 18, fig. 6), never definitely subdivided, or trifid, as they are in *P. triloba*. The Medusa from the Maldive Islands which I described (1902) as *P. simplex*, is *P. martagon*. *Pegantha zonaria* Haeckel is apparently close to, if not identical with it, as may also be the *Pegasia dodecagona* of Péron and Lesueur (1809), redescribed by Haeckel (1879). And this is likewise true of the *Medusa mollicina* Forskål (1775), redescribed by Haeckel (1879), as *Polyxenia mollicina*. But these early descriptions are so unsatisfactory that it is doubtful whether they can ever be definitely connected with any actual Medusa.

All other Peganthas recorded within recent years have sixteen or more tentacles, in connection with a low flat bell, with the exumbrella sculpture much less prominent than that of *P. triloba*. Such are *P. dactyletra* Maas (1893), *P. clara* R. P. Bigelow (1909), *P. smaragdina* H. B. Bigelow (1909a), and the Peganthas described by Vanhöffen (1908a, 1912a, 1912b), as "*Polycolpa forskalii*" Haeckel, and "*Polyxenia cyanostylis*" Eschscholtz.

Pegantha laevis, *P. dactyletra*, and Vanhöffen's "*P. cyanostylis*" agree so closely with one another in the structure of the gonads, which consist of swellings with papilliform lobes or processes, and in the number of tentacles, that they may prove to be identical. But so unsatisfactory are the accounts of *P. cyanostylis* by Eschscholtz (1829) and by Haeckel (1879) that its identity with any actual Medusa must always remain in doubt.

In *P. smaragdina* and *P. clara* the gonads are simple; and they agree with one another closely in tentacle-number, (21–34), and general form; the only differences between them are the degree of convexity of the subumbral side of the disc, and color, *P. clara* being colorless, whereas in *P. smaragdina*[1] the stomach and canal-system are lemon-yellow. And since neither of these characteristics is apt to be of much significance, judging from other Medusae, Vanhöffen (1913b) is probably correct in uniting them, though final decision must await larger series of each than have yet been studied. The specimens described by Vanhöffen (1908a, 1912b) as *Polycolpa forskalii* Haeckel, may perhaps belong here too, though since the gonads were not present, their identity must remain in doubt. But Haeckel's *Polycolpa forskalii* is generically distinct from Pegantha, as here defined, for in living specimens of that species (Haeckel, 1881, p. 31, pl. 10, fig. 1–8), the gonad forms a ring around the stomach, and does not "send out caecal or pouch-like processes into the separate lobe cavities." Only on the assumption that Haeckel's entire account was an error, which the excellent condition of his material forbids, could it be associated with any Pegantha.

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[1] The descriptions of *P. smaragdina* H. B. Bigelow (1909a) and of *P. clara* R. P. Bigelow (1909) appeared almost simultaneously.

P. magnifica Haeckel resembles the *P. clara-P. smaragdina* group in its numerous tentacles (30); but is separated from all other Peganthas by the presence of conical nematocyst knobs on the exumbrella, and by the large number (30–35) of otocysts per marginal lappet.

The following species also apparently belong to Pegantha, as here limited:—*Foveolia diadema* Lesueur, *Aequorea cyanogramma* Quoy & Gaimard, (both redescribed by Haeckel, 1879), *Polyxenia cyanolina* Haeckel. But the accounts of all three are so unsatisfactory that their tentacle-number alone, 16–20 for all, is established. The gonads are described by Haeckel as simple in *P. diadema*, trifid in *P. cyanogramma*, four parted in *P. cyanolina;* but as he saw alcoholic material only, little weight can be laid on them.

PEGANTHA CLARA R. P. Bigelow?

Pegantha clara R. P. Bigelow, 1909, p. 80.

Pegantha smaragdina H. B. Bigelow, 1909a, p. 90, pl. 14, fig. 1, 2, pl. 19, fig. 1–9, pl. 22–26.

Polycolpa forskalii Vanhöffen, 1908a, p. 56; 1912, p. 32; 1912a, p. 391 (non Haeckel, 1879, 1881).

Station								
10,176	50–0 meters	1 spec.	18 mm.	in	diam.	21	tent.
10,176	" "	1 "	16 "	"	"	20	"
10,211	" "	1 "	12 "	"	"	19	"
10,196	surface	1 "	14 "	"	"	23	"

These small specimens are referred to *P. clara*, as the young of that species, on the strength of their numerous tentacles, and the limitation of exumbrella sculpture to the lappets, *P. clara* (incl. *P. smaragdina*, and *P. forskalii* Vanhöffen) being the only Pegantha with upwards of eighteen tentacles before the gonads appear, except, perhaps *P. magnifica*, which, however, has exumbral nettle-warts, and a very large number of otocysts. But as no trace of gonads is yet to be seen on the BACHE specimens, identification can only be provisional.

In the best specimen (the first in the above list) the bell is about 10 mm. high, with thick biconvex central disc, and narrow oval lappets, exumbrella sculpture being limited to the latter. There are four otocysts on most lappets, five on one, with the otoporpae about as long as the lappets. The specimen 14 mm. in diameter has 2–4 otocysts per lappet, that of 12 mm., 2–3 only, each with prominent otoporp.

PEGANTHA DACTYLETRA Maas?

Pegantha dactyletra Maas, 1893, p. 47, taf. 5, fig. 1–8.
?*Pegantha laevis* H. B. Bigelow, 1909a, p. 97, pl. 16, fig. 1, pl. 20, fig. 4–6, pl. 27, fig. 1–7.
?*Polyxenia cyanostylis* Vanhöffen, 1908a, p. 54; 1912, p. 31.
?*Polyxenia cyanostylis* Eschscholtz, 1829, p. 119, taf. 10, fig. 1; Haeckel, 1879, p. 330.

Station									
10,200	surface	1	spec.	20	mm.	in	diam.	16	tentacles
10,200	"	1	"	27	"	"	"	16?	"
10,203	"	1	"	31	"	"	"	16	"

The specimens are in poor condition.

Here again, as in the case of the series referred to *P. clara* (p. 397), immaturity prevents positive identification; but the specimens agree better with *P. dactyletra* than with any other of the genus. Thus they all have the tentacle-number (16), low, rounded bell, smooth biconvex disc, and short, broad, lappets described by Maas (1893); and I need hardly add that a well-developed peripheral canal-system is clearly visible. The number of otocysts per lappet likewise corresponds to that of *P. dactyletra* (5–7) and its close relative (or synonym) *P. laevis*, (1909a, p. 98); for while there are only from 2–5 per lappet each with its otoporp, in the smallest BACHE specimen, I was able to count eight in one lappet of the largest.[1] In all three specimens the future sexual organs are represented by sixteen small, simple, rounded swellings, at the margin of the stomach in the radii of the marginal lappets, already supported by the gelatinous prominences so characteristic of this genus. This is just what would be expected as the earliest stage in the development of the complex gonad of *P. dactyletra*, in which, when adult, each of these primary saccules is supplemented by a number, usually five, of finger-like diverticula. And, this, taken with the other characters first enumerated, seems sufficient to warrant the provisional identification. But the possibility that the present specimens might have developed some other type of gonad, with further growth, must be recognized.

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[1] Both of the larger examples are in such poor condition that most of the otocysts are lost.

AEGINIDAE Gegenbaur.

(*Sensu* Maas 1904b; Bigelow, 1909a).

SOLMUNDELLA Haeckel, 1879.

(For discussion of this genus see Maas (1905); Browne (1905, 1916); Mayer (1910); Vanhöffen (1908a); and Bigelow (1909a).

SOLMUNDELLA BITENTACULATA (Quoy and Gaimard).

Charybdea bitentaculata Quoy & Gaimard, 1834, p. 295, pl. 25, fig. 4, 5.
(For synonymy, see Bigelow, 1909a, p. 77; Mayer, 1910, p. 455).

Station 10,200, 75–0 meters, 1 specimen about 2 mm. in diameter. This young specimen is too much contracted to show either the peronii, gonads, or otocysts, consequently it might belong either to the large (*S. bitententaculata*) or small (*S. mediterranea*) variety of the species.

SCYPHOMEDUSAE.

CHARYBDEIDAE Gegenbaur.

CHARYBDEA MARSUPIALIS var. XAYMACHANA Conant.

Charybdea xaymacana Conant, 1897, p. 8, fig. 8.
(For synonymy, see Mayer, 1910, p. 509).

Station 10,188, surface, 1 specimen, 40 mm. high, with large gonads.

Charybdea xaymacana has usually been considered as distinct from *C. marsupialis*, though obviously a close relative of that well-known Medusa (Mayer, 1910, p. 507). But comparison of the present specimen, and one from Jamaica, with examples from Naples, shows that there is no discontinuity between the West Indian and Mediterranean forms in the characters which have been used to separate them. These are the number of velar canals per octant, *C. marsupialis* having three, occasionally four, *C. xaymachana* described (Conant, 1897, 1898, Mayer, 1910) as having two; and size, *C. marsupialis* being the larger. But the present specimen has three canals in two of the octants, two in each of the other six; and it is of about the same size as *C. marsupialis* as described by Mayer (40 mm. high by 30 mm. broad). It is apparently true, however, that adult Mediterranean specimens are usually larger, and have more velar canals, than West Indian. And for this reason it is wisest to retain the name *xaymachana* for the American variety.

CHARYBDEA ALATA Reynaud.

Charybdea alata Reynaud, 1830, p. 95, pl. 33, fig. 1; Vanhöffen, 1908b, p. 34, fig. 3, 4; Mayer, 1910, p. 510.

The collection contains four young Charybdeas from Stations 10,196, 10,200, 10,208, surface hauls, which are best referred to this species, though positive identification is impossible, because of immaturity.

The most striking feature of these specimens is their large size, for though only the first traces of gonads are visible, they range in height from 42–49 mm.; in diameter from 29–32 mm., with pedalia 20–21 mm. long.

In every case there are three velar canals per octant. Those next the tentacles are invariably branched dichotomously once or twice; of the others (*i. e.*, the two, in each octant, next the rhopalial frenulum), some are simple, some dichotomously branched near their tips; some with small, irregular side branches. This, of course, suggests that at a later stage in development all the canals would be branched; but there is no evidence of future anastomosis. The gonads, though visible in all three specimens, consist merely of narrow, linear bands, hardly 1 mm. broad, obviously a very young stage.

The rhopalia are not in good enough condition to allow a description of the eyes.

These specimens are undoubtedly identical with the somewhat larger examples recorded by Vanhöffen (1908b) as *C. alata*, with which they agree even to minor details; for further discussion see Vanhöffen (1908b) and Mayer (1910).

Periphyllidae Haeckel.

Periphylla hyacinthina Steenstrup.

Periphylla hyacinthina, Steenstrup, 1837.
(For synonymy, see Bigelow, 1909a, p. 26; Mayer, 1910, p. 544).

This species has been discussed so fully by Broch (1913) and by me 1909a, 1913) that I need merely record the occurrence of one young specimen, 18 mm. in diameter, with pigment in the "*dodecabostrycha*" stage, from Station 10,200, 500–0 meters, and 1 specimen, 50 mm. in diameter, from Grampus station 10,352, 40° N. Lat., 68° 44′ W. Long.; 500–0 meters.

Nausithoidae Claus.[1]

Nausithoe punctata Kölliker.

Nausithoe punctata Kölliker, 1852, p. 323.
(For synonymy, see Bigelow, 1909a, p. 35; Mayer, 1910, p. 554).

Station		
10,161	100–0 meters	1 specimen
10,197	200–0 "	1 "
10,206	surface	1 "

These specimens, ranging from 8–10 mm. in diameter, add nothing, except in the way of confirmation, to the various published accounts varying in of this well-known species.

Linuche unguiculata (Schwartz).

Medusa unguiculata Schwartz, 1788, p. 195, taf. 6, fig. 1.
(For synonymy, see Linné, 1788, p. 3159; Mayer, 1910, p. 558; Vanhöffen, 1913b, p. 429).

The collection contains ninety-seven specimens, young and adult, from Stations 10,176, 10,200, 10,202, 10,203 and 10,206, in hauls varying in depth from the surface to 500–0 meters.

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[1] According to Poche (1914) this name was proposed by Claus, in the 4th edition of his Grundzuge der zoologie, 1878, to which I have not had access. But Claus soon abandoned it (1881) in favor of Ephyropsidae, and it seems to have been forgotten. In 1913 I proposed it, as a new name, since Ephyropsidae is not available (1913, p. 85).

Since Vanhöffen (1913b) has demonstrated the unity of *L. unguiculata* and *L. aquila*, all known representatives of Linuche belong to this combined species. The present series adds nothing to the previous accounts.

SIPHONOPHORAE.

Sphaeronectidae Huxley.

(*Sensu* Bigelow, 1911b).

Moser (1912a, p. 528) has revived the name Monophyidae for this family. But although this term is more descriptive than Sphaeronectidae, in its indication of the structural simplicity of the forms in question, the International rules of zoölogical nomenclature forbid its use, Monophyes of Claus (1873) being undoubtedly a synonym of Sphaeronectes Huxley (1859).

Muggiaea spiralis (Bigelow).

Diphyes spiralis Bigelow, 1911b, p. 249, pl. 7, fig. 4, pl. 8, fig. 1, 2, pl. 9, fig. 3, pl. 11, fig. 4; 1913, p. 76.
Muggiaea spiralis Moser, 1915b, p. 654.

This easily recognized species was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,173, 10,176, 10,178, 10,180, 10,182, 10,186, 10,188, 10,212; the captures being both in intermediate hauls and on the surface. The material consists of about 40 nectophores; 2–3 mm. long.

As additional specimens of *M. spiralis* are studied it becomes increasingly certain that it is a monophyid, as Moser (1913a, p. 147, 1915b) maintains, not a diphyid, as I formerly supposed. My original location of it in the latter family was due to the presence, in two specimens, of "a very small bud which was apparently the forerunner of a posterior nectophore" (1911b, p. 251). But these buds were probably either very young siphons or gonophores, because neither Moser, nor I, have found an inferior nectophore, or even any bud far enough advanced to be surely identified as such, although a considerable number of specimens in good condition, have now been studied.

Further than this, the present series adds nothing to my earlier description.

CUBOIDES VITREUS Quoy and Gaimard.

Cuboides vitreus Quoy & Gaimard, 1827, p. 19, pl. 2e, fig. 1–3. (For synonymy, see Bigelow, 1911b, p. 190).

Station 10,198, 75–0 meters, 1 specimen.

PRAYIDAE Kölliker.

AMPHICARYON ACAULE Chun.

Amphicaryon acaule Chun, 1888, p. 1162; Bigelow, 1911b, p. 195, pl. 4, fig. 1–8; Moser, 1912a, p. 529; 1913a, p. 146.

This species was taken at Stations 10,162, 10,166, 10,169, 10,186, 10,187, 10,195, 10,197, 10,203, 10,210; a total of about 30 specimens, in hauls varying in depth from 600–0 meters to 50–0 meters. It was not taken on the surface, most of the captures being from 100–0 meters.

Unfortunately the specimens are all so fragmentary that they add little, beyond confirmation, to my earlier (1911b) account of this peculiar genus. I may note however, that in none of them does the larger nectophore entirely enclose the smaller scale-like one as Chun (1888) describes it; nor was this the case in any of the ALBATROSS specimens. And the lateral subumbral canals of the larger nectophore usually bear a series of short lateral diverticula near their upper end, which were not present in the ALBATROSS specimens from the eastern Pacific (1911b).

The extreme reduction of the stem to a disc or plate, mentioned by Chun (1888), is very evident in several of the present specimens, the cormidia being borne on short stalks on either side of the lines of attachment of the two nectophores. In the larger specimens there are 6–9 cormidia, 3–5 on either side.

HIPPOPODIIDAE Kölliker.

Most recent students (Haeckel 1888, Chun 1897b, Bigelow, 1911b) have recognized two genera in this family, Hippopodius with rounded, Vogtia with angular nectophores. Schneider (1898) and Moser (1911–1915) have united them, thinking this character too trivial to be given generic importance. But the study of a new hippopodid in the BACHE collection has convinced me that neither of these schemes is correct, Vogtia and Hippopodius being actually separable, not by the form of the gonophores, but by a much more important character, structure of the tentilla. In Hippopodius, as has long been known, these organs, when adult, consist of a large, sac-like cnidosac (Plate **7**, fig. 7), with single terminal filament. And this state is attained by a direct development (Plate **7**, fig. 6). In Vogtia, it is true, the adult tentillum (Plate **4**, fig. 7; 1911b, Plate **15**, fig. 7) resembles that of Hippopodius superficially. But in its development it passes through a spirally coiled stage (Plate **4**, fig. 6), closely resembling the tentilla of certain agalmids. And the apparent cnidosac of the adult tentillum of Vogtia is in reality the spiral cnidoband of the younger tentillum, shortened and flattened into one plane; *i. e.*, a secondary, not a primary development. The difference between young tentilla of the two genera is very striking.

The new hippodid described (p. 407) has tentilla of the "Vogtia" type, though its nectophores are rounded, like Hippopodius. And as the structure of the tentillum is undoubtedly far more important in phylogeny, and hence classification, than the mere details of outline of the nectophores, it follows that the latter can no longer be used as a generic character in this connection.

Hippopodius hippopus (Forskål).

Plate **7**, fig. 6, 7.

Gleba hippopus Forskål, 1775, p. 14; 1776, pl. 43, fig. E.
(For synonymy, see Bigelow, 1911b, p. 208).

This well-known siphonophore was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,173, 10,176, 10,178, 10,180, 10,182, 10,184, 10,186, 10,187, 10,188, 10,192, 10,194, 10,195, 10,197, 10,198, 10,200, 10,202, 10,203, 10,207, 10,208, 10,209, 10,210, 10,211. Some of the captures were made on the surface, most of them, however, in open-net hauls from 100 fathoms, or more. Thus it was almost universal in the warm waters traversed by the Bache, failing to appear at only 8 out of 37 tow-net stations. But it did not occur in the cool coastal water off Chesapeake Bay (Stations 10,157–10,160).

Hippopodius hippopus has so often been recorded, and is so well known, that no account is needed here, further than to point out that none of the spherical larvae, or primary bells, of this species, so characteristic and easily recognized (Chun, 1897a), were detected in the Bache collections, though they outnumbered the adults in the

RESEARCH collections from the Bay of Biscay (1911a). Most of the BACHE specimens are fragmentary, but their bells, though dissociated, are sufficiently preserved for their characteristic outlines to identify them at a glance.

VOGTIA Kölliker, 1853.

How many species are represented by the representatives of this genus previously described, is still an open question. I formerly recognized two only, *V. pentacantha* Kölliker and *V. spinosa* Keferstein and Ehlers. But Moser (1913a, 1915a, 1915b) believes that the specimens from Bering Sea described by me (1913) were in reality a new species, which she has christened *V. serrata*. And she has not only studied specimens of this form, from the collections of the GAUSS but compared them with *V. pentacantha* from the Mediterranean. Unfortunately her preliminary papers give no description of her specimens of *V. serrata;* nor does she state how she would distinguish it from *V. pentacantha*. But from the fact that she refers my Bering Sea (1913) series to it, I can only assume that she applies this name to Vogtias in which neither the facets nor the angles of old nectophores are spinous. In *V. spinosa* both facets and angles bear prominent tubercles or spines (Kefferstein and Ehlers, 1861, Haeckel, 1888b, Bigelow, 1911b, p. 211, pl. 15, fig. 9, 10), whereas in the Mediterranean *V. pentacantha* as described both by Kölliker (1853) and by Keferstein and Ehlers (1861), and in the Biscayan specimen recorded by me (1911a), the angles are spinous or tuberculate, the facets smooth. As Moser (1913a) points out, *V. pentacantha* is intermediate between *V. spinosa* and *V. serrata*. And such extremes as *V. spinosa*, on the one hand, and the smooth angled Bering Sea specimens (1913) on the other, would undoubtedly represent two wholly distinct species, were they discontinuous. But this is not the case, for not only is *V. pentacantha* intermediate between the two, with its young nectophores almost exactly paralleling those of *V. spinosa* (p. 406), but the latter is itself variable in the degree of spination of nectophores. So few specimens of the *V. pentacantha* type have been examined critically except by Moser, that final decision may well await the appearance of her detailed account. In the meanwhile all three species may be retained.

All these Vogtias have angular nectophores. But the BACHE collection contains one specimen of a new species (p. 407), with the Vogtia type of tentillum, but with rounded nectophores.

VOGTIA PENTACANTHA Kölliker.

Plate **4**, fig. 1.

Vogtia pentacantha Kolliker, 1853, p. 31, tab. 8; Kefferstein & Ehlers, 1861, p. 23, taf. 5, fig. 12–15; Chun, 1897b, p. 35, taf. 1, fig. 11–14; Bigelow, 1911a, p. 351; Moser, 1915b, p. 653.
?Non *Vogtia pentacantha* Bigelow, 1913, p. 66, pl. 5, fig. 7–9, pl. 6, fig. 6.

Station 10,206, 400–0 meters, one much contracted colony with about 13 nectophores still attached.

This example is in excellent condition, except for being contracted. On the older nectophores (Plate **4**, fig. 1) the facets are perfectly smooth, but the angles between them bear varying numbers of conical gelatinous tubercles just as in the specimens collected by the RESEARCH (1911a, p. 351), and by the PLANKTON expedition (Chun, 1897b). Occasionally a tubercle apparently belongs to a facet, not to an angle; but this appearance is the result of contraction. I may further point out, as substantiating Moser's (1913a) statement that *V. pentacantha* is intermediate between *V. spinosa* and *V. serrata*, that not only the sculpture of the nectophores, but the structure of the ventral sinus, is intermediate between the two. As I have already shown (1913), the ventral sinus in *V. spinosa* (adult nectophores) is in the form of two lateral wings, narrowest next the ventral subumbral canal, whereas in the Bering Sea specimens, identified by me as *V. pentacantha*, but which really belong to *V. serrata* (if that species prove valid), it is reduced, in the old nectophores, to a slight thickening of the ventral canal. In the oldest nectophores of the present specimen we find a condition mid-way between these two extremes, the ventral sinus (Plate **4**, fig. 1) being much smaller than in *V. spinosa* nectophores of a corresponding age, but nevertheless extending on either side of the canal as a short wing. Young nectophores of this specimen are spinous on facets as well as angles; in fact are indistinguishable from nectophores of *V. spinosa* of corresponding age, thus corroborating Moser (1913a). In all other respects the specimen so closely resembles *V. spinosa* that no further account is needed, except to point out that the relationship of the nectophores, and the elongated "knospungszone" on which they are borne, is exactly the same as in other members of Vogtia (1911b, 1913) and in Hippopodius (Chun, 1897a, Bigelow, 1913).

VOGTIA GLABRA, sp. nov.

Plate **4**, fig. 2–7.

Station 10,202, 450–0 meters, one specimen with 3 nectophores; also 4 loose nectophores; in good condition. TYPE.

In its general organization, this new species agrees exactly with other species of Vogtia (1911b, 1913), and with *Hippopodius hippopus*, particularly in the relationship of the elongated "knospungzone" which bears the nectophores to the siphosome, of which Chun (1897a, 1913) and Richter (1907) have given excellent accounts. But the nectophores are strikingly characteristic. The youngest nectophore (aside from a very small bud), already 7 mm. long, is elongate in outline (Plate **4**, fig. 2, 3), its apex prolonged into a triangular process, and there are two principal dorsal prominences, one on either side, about mid-way between the nectosac and the apex, which, though trivial in their nature, prove to be an important specific character.

In ventral view (Plate **4**, fig. 3), it is seen that there is a deep hydroecial groove, running the whole length of the nectophore, and partially enclosed by its lateral flaps, particularly near the apex. At this early stage the ventral sinus is large.

The next older nectophore (Plate **4**, fig. 4) already 17 mm. long, is relatively shorter and broader, and its outline more rounded. But the apical point, and the two dorsolateral prominences are as evident as at the earlier stage. And there is no trace of the four dorsal prominences which bound the margin of the nectosac in *H. hippopus*, unless the dorsolateral prominences can be said to represent them. Corresponding to the general alteration in the shape of the nectophore, which takes place with growth, the hydroecial groove is shallower, and broader, its enclosing flaps lower; and the ventral sinus has decreased in relative size.

The large nectophores (27–30 mm. broad) are nearly circular in outline (Plate **4**, fig. 5), with very broad, shallow hydroecium. But the two dorsolateral, and the apical, prominences are as evident as before.

The rounded outlines of the nectophore separate *V. glabra* at a glance from the other members of Vogtia. And though it resembles *Hippopodius hippopus* superficially in this respect, the bells of the two species differ characteristically in detail. Thus, in the latter, the apex of the bell is rounded, not pointed, even in nectophores only 3–4 mm. long, while the dorsolateral prominences of *Vogtia glabra* are replaced, in *Hippopodius hippopus* by a series of four knobs, close to, and often overhanging, the dorsal margin of the nectosac, as has so often been described.

Tentilla. The adult tentilla of *V. glabra* (Plate **4**, fig. 7) very closely resemble those of *V. spinosa* (1911b, plate **15**, fig. 7), consisting of the same coiled cnidoband, lying nearly in a single plane so as to simulate the cnidosac of Hippopodius, and of a single terminal filament, though the large spindle-shaped cnidoblasts are fewer in number. And, as in *V. spinosa,* the tentillum, in its development, passes through a stage in which the cnidoband is spirally coiled (Plate **4**, fig. 6), the final state being apparently attained by a loosening of the spiral, and its contraction into one plane.

Siphons and *gonophores.* These organs so closely resemble those of *V. spinosa* (1911b, p. 212) that no account is necessary here further than to point out that like that species, each cormidium bears both ♂ and ♀ gonophores.

DIPHYIDAE Eschscholtz.

I have discussed elsewhere (1911b) the three subfamilies, Abylinae, Galeolarinae, and Diphyopsinae, into which this family has usually been divided and believe that the limits previously given them still stand; but with the addition of a fourth, Clausophyinae (Bigelow, 1913, p. 70), for the reception of Clausophyes. Moser (1913a, p. 148), it is true, has recently given a new definition to the Galeolarinae, expanding it to include "alle Diphyes-Ähnlichen formen . . . . , bei deren Oberglocke das Hydroecium rudimentar ist, und tiefer als der mund legt, wahrend es bei der unterglocke sehr primitiv ist." But the nature of the cormidia, whether detached as free-living eudoxids (Diphyopsinae), or permanently connected with the stem (Galeolarinae), seems to me a much more fundamental matter than the precise outlines of the hydroecium. And at any rate, the former is an absolute, the latter only a gradual difference, for there is no sharp line between species with deep, and those with shallow, or suppressed hydroecium.

ABYLA TRIGONA Quoy and Gaimard.

Abyla trigona Quoy & Gaimard, 1827, p. 14, pl. 2B, fig. 1–8.
(For synonymy, see Bigelow, 1911b, p. 221).

This well-known species was taken at Stations 10,163, 10,166, 10,171, 10,178, 10,186, 10,192, 10,194, 10,207, and 10,211, in both surface and intermediate hauls. The material consists of two entire specimens and fifteen superior nectophores, and two eudoxids.

ABYLA LEUCKARTII Huxley.

Abyla leuckartii Huxley, 1859, p. 49, pl. 3, fig. 2; Agassiz & Mayer, 1902, p. 165 (*partim*); Lens & Van Riemsdijk, 1908, p. 34, pl. 5, fig. 42–46; Bigelow, 1911b, p. 216, pl. 13, fig. 5–8, pl. 15, fig. 3, 4; Moser, 1913a, p. 149.
Enneagonum leuckartii Schneider, 1898, p. 93.

Station 10,194, 100– meters, one superior nectophore, 6 mm. long. The identity of this specimen rests on actual comparison with specimens from the West Indies, and from the Pacific (1911b).

ABYLA DENTATA, sp. nov.

Plate **5**, fig. 1–4.

Station 10,166, 100–0 meters, one superior nectophore. Extreme length (apical margin to tip of basal tooth), 14 mm. TYPE.

Station 10,171, 75–0 meters, one superior nectophore, badly distorted.

These large nectophores evidently belong to the *A. trigona-leuckartii* group, *i. e.*, are true Abyla, in the restricted sense (1911b, p. 213). But they differ so much from all described species in the arrangement of ridges and facets, as to necessitate a new species. Like *A. leuckartii*, the nectophore is pentagonal in side view, its upper portion rectangular (Plate **5**, fig. 1); but it is much thicker than that species, a fact which gives it a characteristic cubical appearance. The facets are essentially the same as those of *A. leuckartii*, *i. e.*, apical, dorsal, ventral, dorsolateral, and ventrolateral. The most diagnostic feature of this new species is the dorsal facet of its superior nectophore. In all other Abylas, *i. e. A. leuckartii*, *A. trigona*, and *A. haeckeli*, this is rectangular. But in *A. dentata* it is essentially triangular (Plate **5**, fig. 3), its apex apical, its base deeply emarginate, with its lateral margins strongly bowed, and very prominently toothed in the lower $\frac{2}{3}$ of their length.

The ventral facet (Plate **5**, fig. 2) at first sight suggests *A. trigona* (1911a, pl. 13, fig. 4), being similarly pointed basally, and emarginate laterally near its upper end, while lacking the transverse ridge which subdivides it in *A. haeckeli*. But instead of being limited apically by a distinct apicoventral ridge, as is the case in *A. leuckartii*, *A. trigona*, and *A. haeckeli*, it is continuous here with the apical ridge, one merely curving into the other. The lateral margins of the ventral, like the dorsal facet, are strongly toothed along their lower halves.

The dorsolateral facet resembles *A. trigona*, the lateral ridge extending to the basal tooth of the hydroecium, instead of terminating some distance above it, as is the case in *A. leuckartii*. But the ventrolateral facet is single, as in the latter, instead of being subdivided by a transverse ridge, as it is in both *A. trigona* and *A. haeckeli*. And corresponding to the continuity of ventral and apical facets, its ventral margin is rounded, instead of angular. Its basal margin is strongly toothed as is also the lateral ridge. The apical facet (Plate **5**, fig. 4), is essentially pentagonal, but it has only three distinct angles, dorsal, and two lateral, there being no ventral angles, owing to the continuity of apical with ventral facet. This outline, particularly the fact that the apical facet is pointed at its dorsal end, is characteristic, for in both *A. trigona*, *A. haeckeli*, and *A. leuckartii* it is hexagonal, its dorsal end bounded by a transverse margin instead of an angle, owing to the different shape of the dorsal facet.

As illustrated by the apical view (Plate **5**, fig. 4), all the facets are deeply concave, a fact which gives the nectophore a very characteristic appearance.

The hydroecium (Plate **5**, fig. 1), though of the ordinary abylid type, is shallower than in other members of Abyla (*sensu strictu*) occupying only about two thirds of the length of the nectophore. But the nectosac extends almost the whole length of the nectophore, the pedicular canal joining it a considerable distance below its apex; and consequently its dorsoradial canal follows a diphyid rather than an abylid, course, just as in Ceratocymba (1911b, p. 232).

The somatocyst is oval, much as in *A. leuckartii*, except that its pedicular canal joins it some distance below its apex.

No account of the appendages is possible, only a few much contracted young siphons, with their tentilla, being visible, and the inferior nectophore is lost.

The features just mentioned, of which the triangular dorsal facet, the continuity of ventral and apical facets and the dorsal angle of the latter, are most diagnostic, suffice to separate *Abyla dentata* from all abylids yet described. But it is not certain that the BACHE specimen is the first which has been studied, for Moser (1913a, p. 149) mentions as close allies of the *A. trigona*-*A. leuckartii* group, two new abylids (as yet unnamed) from the collections of the German South Polar Expedition, one or other of which may prove to be identical with *A. dentata*, when described.

ABYLOPSIS TETRAGONA (Otto).

Pyramis tetragona Otto, 1823, p. 306, taf. 42, fig. 2a–2c.
(For synonymy see Bigelow, 1911b, p. 224).

This well-known species was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,173, 10,176, 10,178, 10,180, 10,182, 10,186, 10,192, 10,196, 10,197, 10,200, 10,202, 10,203, 10,208, 10,209, 10,211, 10,212; both in surface and intermediate hauls, about 200 specimens. The free eudoxid was taken at Stations 10,161, 10,169, 10,192. The specimens, all more or less damaged, agree so well with previous descriptions that no account of them is necessary.

ABYLOPSIS ESCHSCHOLTZII (Huxley).

Aglaismoides eschscholtzii Huxley, 1859, p. 60, pl. 4, fig. 2.
(For synonymy, see Bigelow, 1911b, p. 226).

The polygastric generation was taken at Stations 10,161, 10,163, 10,169, 10,171, 10,176, 10,178, 10,186, 10,188, 10,192, 10,197, 10,207, 10,212, about 75 specimens; the free eudoxid at Stations 10,161, 10,169, 10,171, 10,188, 10,192.

BASSIA BASSENSIS (Quoy and Gaimard).

Diphyes bassensis Quoy & Gaimard, 1834, p. 91, pl. 7, fig. 18–20.
(For synonymy, see Bigelow, 1911b, p. 229).

The polygastric generation of *Bassia bassensis*, or its free eudoxid, was taken at Stations 10,161, 10,162, 10,163, 10,169, 10,176, 10,178, 10,180, 10,182, 10,188, 10,192, 10,208, 10,210, and 10,212, about 50 specimens of each. The records are both from surface and from intermediate hauls.

There is no difficulty in recognizing such characteristic nectophores as those of this species, though the material is in poor condition.

CERATOCYMBA SAGITTATA (Quoy and Gaimard).

Plate **5**, fig. 5; Plate **6**, fig. 1–3; Plate **7**, fig. 1–5.

The free eudoxid has been described as: —

Cymba sagittata Quoy & Gaimard, 1827, p. 16, pl. 2c; fig. 1–9; Eschscholtz, 1829, p. 134; Lesson, 1843, p. 454.

Diphyes cymba Quoy & Gaimard, 1834, p. 95, pl. 5, fig. 12–17.
Nacella sagittata Blainville, 1830, p. 120; 1834, p. 131, pl. 4, fig. 2.
Ceratocymba spectabilis Chun, 1888, p. 1160.
Ceratocymba sagittata Chun, 1897, p. 33; Bedot, 1904, p. 1, pl. 1, fig. 1; Moser, 1911, p. 431; 1912a, p. 538, fig. 22; 1913a, p. 149.

The synonymy of the polygastric generation is:—

Diphyabyla hubrechti Lens & Van Riemsdijk, 1908, p. 36, pl. 6, fig. 47; Bigelow, 1911b, p. 231, pl. 12, fig. 7; Moser, 1911, p. 431; 1913a, p. 149.

The polygastric generation was taken as follows:—

Station						
10,161	surface		3	superior	nectophores	
10,162	150–0	meters	1	"	"	and 2 inferior nectophores
10,176	50–0	"	1	"	"	and 1 inferior nectophore
10,180	75–0	"	1	"	"	and 1 inferior nectophore
10,182	75–0	"	1	"	"	and 1 inferior nectophore
10,182	1000–0	"	1	"	"	
10,184	50–0	"	1	"	"	and 2 inferior nectophores
10,186	25–0	"	3	"	"	and 1 inferior nectophore
10,194	100–0	"	1	"	"	
10,203	150–0	"	1	"	"	
10,212	500–0	"	1	"	"	

The free eudoxid was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,173, 10,178, 10,180, 10,182, 10,184, 10,186, 10,187, 10,188, 10,194, 10,195, 10,198, 10,203, 10,208, 10,211; a total of about 140 specimens.

Since Moser (1912a, 1913a), whom I can corroborate here, has found that *Ceratocymba sagittata* is the free eudoxid of *Diphyabyla hubrechti*,[1] the former (older) name must, of course, be employed. The superior nectophores range, in length, from 9 to 31 mm.; the inferior nectophores from 20 to 40 mm.

Superior nectophores of this species have already been figured, and described in detail by Lens and Van Riemsdijk (1908) for a large, by me (1911b) for a small specimen. The present series connects these two extremes, showing that the slight differences in outline, between the two, are merely indications of different stages in growth.

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[1] Moser (1913a, p. 149) states that I have believed *C. sagittata* to be the eudoxid of *Abyla leuckartii*; but this was an error on her part, it being *C. asymetrica* Lens and Van Riemsdijk which I so identified (1911b, p. 219); and probably correctly, as pointed out below (p. 414).

Most striking of these is that the pointed apex of the nectophore above the level of the somatocyst is longer in the adult than in the young; the nectosac being correspondingly longer, the somatocyst proportionately smaller, the triangular hydroecium proportionately broader at its mouth. But the same characteristic arrangement of ridges and facets is to be seen at all stages in growth. And this is likewise true of the basal teeth of both nectosac and hydroecium. In the young specimen listed here, and in the still smaller ALBATROSS example the apex of the nectophore is bent ventrally, above the level of the somatocyst. But since it bends dorsally, though at about the same level in all the large specimens, both SIBOGA (Lens and Van Riemsdijk, 1908) and BACHE, it is a question whether this bending is normal, or the result of contraction or preservation.

Inferior nectophore. The inferior nectophore of Ceratocymba has not previously been described, though it is figured by Moser (1912b, fig. 23). The inferior nectophores listed above (p. 412) occurred side by side with the anterior ones, and, from this fact, from their large size (20–45 mm. long) and resemblance to the gonophores of Diphyabyla, and from Moser's (1912b) figure, probably belonged to it. The general outline with its long, narrow nectosac, is better shown (Plate 7, fig. 1), than verbally. Its most diagnostic feature is its curious asymmetry, not sufficiently illustrated by Moser. The hydroecium is open, ventrally, from end to end, enclosed, however, by two broad flaps. Of these, the right hand one terminates in a very long basal tooth (Plate 7, fig. 1) whereas the left hand one has no basal tooth but merely makes a right-angle with the short dorso-basal wall of the hydroecium. The latter, as well as the basal parts of the hydroecial flaps, bears a series of prominent, hook-like serrations. The mouth of the nectosac is armed with two very prominent triangular teeth, right and left lateral; and a very much smaller dorsal tooth. Besides the flaps, the nectophore has two ridges, so prominent as to be better described, perhaps, as wings, at first sight apparently a dorsal and a left lateral. But the former is in reality the right lateral, for it terminates in the right lateral basal tooth. The dorsal ridge is almost entirely suppressed, except close to its base, being traceable for most of its course only as a faint line. The nectophore is thus triangular in cross-section, like that of *Abyla trigona.* But the resemblance between the two is purely superficial, for in *A. trigona* it is the right lateral ridge, not the dorsal, which is suppressed. Above the level of the nectosac the apex of the bell is prolonged in a narrow triangle.

The subumbral canals (Plate 7, fig. 1), are of the usual abylid type, *i. e.*; do not parallel those of *A. tetragona* (Bigelow, 1911b). In all cases the stem is much contracted, or broken off; as a rule only very young siphons and tracts being visible. But in one specimen from Station 10,180 a group of appendages, or "eudoxid," so far advanced as to be nearly ready to assume its independent sexual existence, is still intact. In its main features (Plate **6**, fig. 1), this eudoxid closely resembles the corresponding phase of *Abyla leuckartii* (Bigelow, 1911b, pl. 13, fig. 8), the somatocysts of the two agreeing even to the recurved tip of its descending branch. And the bract is similarly asymmetrical, consisting of three facets, dorsal, and two laterals, of which the left hand is much the smallest (the apical region is still open, for the passage of the stem). But in Ceratocymba the margins of the bract, and its left lateral ridge, are very strongly toothed, whereas in the slightly younger specimen of *A. leuckartii* they were smooth, or only minutely denticulate.

The chief interest of this eudoxid is its corroboration of Moser's (1911, 1912a, 1913a) statement that the free-swimming sexual phase of "Diphyabyla," like that of *Abyla leuckartii* (Bigelow, 1911b), is a "Ceratocymba." Two species of "Ceratocymba" are known, *C. sagittata* Quoy and Gaimard, well described by Chun (1888, 1897b) and by Bedot (1904), which according to Moser is the eudoxid of Diphyabyla, and *C. asymetrica* Lens and Van Riemsdijk, the latter the eudoxid of *Abyla leuckartii* (Bigelow, 1911b, p. 219).[1]

According to Moser (1913a), their bracts are exactly alike. But, though both are essentially similar, with the same peculiar asymmetry, my experience has been that they are readily separated by characteristic, if minor, features. Most important of these is the fact that whereas the left lateral (the asymmetrical) ridge of the latter invariably joins the left apical ridge, and the apical facet is correspondingly quadrilateral in outline (Bigelow, 1911b, pl. 15, fig. 4), in *C. sagittata* the lateral ridge never reaches the apical ridge, and the apical facet is triangular (Plate **5**, fig. 5). Furthermore, while the apical facet of the eudoxid of *Abyla leuckartii* is flat, or even slightly convex, in *Ceratocymba sagittata* it is deeply concave, with prominent lateral angles or horns. This concavity is greatest in small specimens, but it characterizes the largest also, though to a less and varying degree (Chun, 1888). Finally, as a general rule at least, the somatocyst is relatively smaller in the latter than in the former. The gonophores of the two "Ceratocymbas" are even more diagnostic (Moser, 1913a), that of the eudoxid of *Abyla leuckartii* (*C. asymetrica*) having the two basoventral teeth short, and roughly equal in length (Plate **6**, fig. 4, Lens and Van Riemsdijk, 1908), whereas in *Ceratocymba sagittata* one of these teeth is very long, the other very short (Plate **7**, fig. 2, 3) as observed by Chun (1888) and Bedot (1904). One of the most interesting features of *Ceratocymba asymetrica,* is that the ♀ and ♂ gonophores are not alike (Moser, 1912a) the right basoventral tooth being prolonged in the male, the left hand one in the female (Plate **7**, fig. 2–5); and the asymmetry of the hydroecial walls being similarly reversed, the left hand one largest in the ♂, the right hand in the female. Furthermore, the asymmetry of these ridges is much more pronounced in the male than in the female.

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[1] Following Lens and Van Riemsdijk (1908), I formerly (1911b) referred the *C. sagittata* Bedot (1904) to *C. asymetrica*. But actual examination of the two forms shows that there is no connection between them; *C. sagittata* being identified at a glance by its characteristic gonophores, as described below (p. 415).

So far as its bract is concerned the eudoxid here described might equally well develop into either "Ceratocymba." But its gonophore (Plate **6**, fig. 2) unmistakably connects it with *C. sagittata,* thus corroborating Moser; for even at this early stage the right basoventral tooth is longest, the left hydroecial wall broadest (in the ♂): while the basodorsal tooth is of the spur-like outline characteristic of *C. sagittata.* And the characteristic asymmetry, with prominent wing-like left-lateral ridge, smaller right-lateral ridge, and suppressed dorsal ridge, is already well developed.

In slightly older gonophores, from the free eudoxid, the disparity in length between the two basoventral teeth is greater. And with further growth the difference increases, until it is very marked (Plate **7**, figs. 2, 3; Moser, 1912b, fig. 23), while an equally striking change takes place, with growth, in the hydroecium, its broad enclosing flaps dwindling, until in examples upwards of 30 mm. long, the hydroecium is wide open (Plate **7**, fig. 4, 5).

Moser (1912a) has already noted the similarity between the inferior nectophore, and the ♂ gonophore of the free eudoxid, in *Ceratocymba sagittata.* This I need merely corroborate, pointing out that in both it is the right hand basoventral tooth which is prolonged, and that in both the left-lateral ridge is far more prominent than the right hand one, with the dorsal ridge practically suppressed.

GALEOLARIA Blainville, 1834.

Diphyidae, with rounded nectophores, of about the same size; the groups of appendages are permanently attached to the stem.

This definition excludes the *D. truncata* Sars, referred to Galeolaria by Moser (1913b, 1915a, 1915b). Recent researches have shown that specific differences, consisting chiefly of the number and arrangement of basal wings and teeth, are particularly clear cut in this genus. And though the value of these characters has only recently been appreciated, it has usually been possible to connect the actual specimens at hand with the older accounts and figures.

Three species, *G. quadrivalvis* (Blainville), *G. australis* Quoy and Gaimard, and *G. monoica* Chun have recently been redescribed in detail (Lens and Van Riemsdijk, 1908, Bigelow, 1911b). Briefly stated their diagnostic features are as follows: —

In *G. quadrivalvis* the superior nectophore has two dorsobasal teeth and two ventrobasal wings, the inferior has four basal teeth (two dorsal, two lateral) and two basoventral wings; and it is further characterized by peculiar constrictions of the inferior nectophore. *Galeolaria australis* has no basal teeth; but the superior nectophore has two, the inferior a single, ventrobasal wing. In *G. monoica* the superior nectophore has one dorsobasal tooth; two laterobasal teeth; two lateral flaps next the latter, and two large ventrobasal wings; while the somatocyst is very small. Its inferior nectophore has three dorsal teeth, incised at the tip; two lateral triangular angles, and a single large ventrobasal wing.

Aside from *G. chuni* Lens and Van Riemsdijk (1908), which, according to my view is probably *G. australis*, though it is retained by Moser (1913a, p. 148) as a distinct species, all Galeolarias described within recent years can be referred to one, or other, of these three species. But the present collection contains a representative of the genus which, while it resembles *G. quadrivalvis* in its inferior nectophore, differs from all three in the presence of four basal teeth, in the superior nectophore.

This species so closely resembles *G. quadrivalvis* in its general appearance, that it is probable that the two have been confused; indeed the M. C. Z. collection contains two excellent specimens of the "quadridentate" form, received from the Zoölogical station at Naples as *G. quadrivalvis*. For the stability of the nomenclature of the genus it is, of course, desirable to establish to which of these species, with bidentate or with quadridentate superior nectophore, the name *G. quadrivalvis* really belongs. But here, as so often, we are faced by the difficulty that the original account of *G. quadrivalvis* (Blainville, 1834), being taken from the inferior nectophore, applies equally well to either. However, it certainly belongs to one or the other of them. And inasmuch as the quadridentate form is probably the *G. quadridentata* of Quoy and Gaimard (1834), which was described almost simultaneously, but has since remained problematical, there is every reason to continue to use the name *G. quadrivalvis* for the bidentate species. And there is the more reason for this, since Gegenbaur's (1853) account of *G. quadrivalvis* was probably taken from the bidentate form, though his description of the base of the superior nectophore, crediting it with only *one* dorsal tooth, is not clear. And Vogt's (1854) *G. auriantaca* probably belongs here too, for it is not likely that he would have overlooked the large basal teeth of the superior nectophore, had he been dealing with *G. quadridentata*. But we owe to Leuckart (1854, "*G. filiformis*") the first satisfactory account of basal structure of the bidentate species, for he records both the two dorsal teeth, and the two ventral wings of the superior nectophore. (See Bigelow, 1911b).

GALEOLARIA QUADRIDENTATA Quoy and Gaimard.

Plate **8**, fig. 1, 2.

Galeolaria quadridentata Quoy & Gaimard, 1834, p. 45, pl. 5, fig. 32, 33.

Station 10,186, 185–0 meters, 1 superior and 1 inferior nectophore, respectively 12, and 16 mm. long, in good condition.

Station 10,197, 100–0 meters, one superior nectophore, 9 mm. long, in good condition.

Also 2 superior and 2 inferior nectophores, from the Gulf Stream, latitude 38° 33′ N., longitude 70° 80′ W., GRAMPUS Station 6, 1908; and 2 entire specimens from Naples.

Superior nectophore. The superior nectophore (Plate **8**, fig. 1) so closely resembles that of *G. quadrivalvis* in its general form that it might well be confused with it, were it not for its basal teeth, and for the fact that the somatocyst is somewhat shorter, and stouter, than in the specimens of that species which I have seen (1911b, pl. 5, fig. 2). The lateral subumbral canals arise from the ring-canal, at the point of origin of the ventral canal, as in *G. quadrivalvis* and *G. australis*, instead of from the ventral canal, at some distance above the ring-canal, as is the case in *G. monoica*.

The basal sculpture is the most important specific character of this, as of all other species of Galeolaria. As pointed out above (p. 416), the bell-opening is surrounded by four teeth, and two ventral wings or flaps (Plate **8**, fig. 2). Of these teeth, two are lateral, two dorsal.

And the indentation between the latter is shallower than that between each dorsal tooth and the lateral tooth which flanks it. As is usual in Galeolaria, the teeth are triangular, with rounded, or very slightly dilated, tips; the dorsal teeth deeper than the scale-like lateral teeth. The ventral wings are much shorter than in *G. quadrivalvis, G. australis,* or *G. monoica,* squarish in outline, each with a peculiar indentation of its basal margin (Plate 8, fig. 2); and they are entirely separated along the mid-line.

The identity of the inferior nectophore listed above rests not only on the fact that it was taken in the same haul as the superior one just described (they were not attached), but on the fact that it agrees perfectly with the inferior nectophores of two specimens of *G. quadridentata* from Naples. I have not been able to find a single character to separate the inferior nectophore of *G. quadridentata* from that of *G. quadrivalvis,* the former, like the latter, having four basal teeth, and two large basal wings, with secondary flaps on their inner margins; besides even showing the transverse constrictions formerly thought diagnostic of the latter.

The stem with all its appendages, has been lost in both BACHE specimens. In those from Naples (both females), in which it is well preserved, the appendages closely resemble those of *G. quadrivalvis* (1911b, pl. 5, figs. 5–7).

The identification of these specimens as the *G. quadridentata* of Quoy and Gaimard, rests on the presence of the four basal teeth in the superior nectophore, clearly shown in their figure, and described by them as "quatre pointes" (1834, p. 45, pl. 5, fig. 32, 33). The only difference is that the basal wings are shorter in our specimens than in their figure. But this is not sufficient, as against the evidence of the basal teeth, to warrant a new species, which would be necessary were they not referred to *G. quadridentata,* for no other Galeolaria so far described has four teeth in the superior nectophore.

GALEOLARIA MONOICA (Chun).

Epibulia monoica Chun, 1888, p. 1157.
(For synonymy and description, see Bigelow, 1911b, p. 239).

This species was taken at Stations 10,161, 10,163, 10,166, 10,169, 10,176, 10,180, 10,186, 10,188, 10,196, 10,198, 10,200, both on the surface and in intermediate hauls. The series consists of about thirty superior and as many inferior nectophores.

These specimens agree, even to such minor details as the relative size of dorsolateral and basolateral teeth, with the Pacific collections which I have studied (1911b, 1913).

Galeolaria monoica is easily identified by the presence of three basal teeth (two large lateral and one narrow dorsal) and two ventral wings in the anterior, three dorsal teeth with incised tips, and an undivided basal wing, in the inferior nectophore.

GALEOLARIA AUSTRALIS Quoy and Gaimard.

Galeolaria australis Quoy & Gaimard, 1834, p. 42, pl. 5, fig. 29–31; Blainville, 1834, p. 129, pl. 6, fig. 6; Lesson, 1843, p. 140; Haeckel, 1888b, p. 151; Bigelow, 1911b, p. 238, pl. 5, fig. 8, 9; pl. 6, fig. 1–3; 1913, p. 69; Moser, 1913a, p. 148, 1915a, p. 205.

Diphyes biloba Sars, 1846, p. 45, taf. 7, fig. 16–21; Schneider, 1898, p. 86.

Galeolaria filiformis Huxley, 1859, p. 38, pl. 3, fig. 5 (*non* Leuckart, 1854).

Diphyes turgida Gegenbaur, 1853, p. 344.

Diphyes sarsii Gegenbaur, 1860, p. 372, taf. 29, fig. 30, 31.

Epibulia turgida Haeckel, 1888a, p. 35.

Galeolaria turgida Haeckel, 1888b, p. 151; Lens & Van Riemsdijk, 1908, p. 57.

Galeolaria biloba Haeckel, 1888b, p. 151; Chun, 1897b, p. 17; Vanhöffen, 1906, p. 16; Römer, 1901, p. 173; Lens & Van Riemsdijk, 1908, p. 59, pl. 9, fig. 75.

Galeolaria australis was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,176, 10,178, 10,186, 10,194, 10,196, 10,197, 10,200, 10,203, 10,207, 10,212; both on the surface, and in intermediate hauls. The material consists of about thirty superior and thirty inferior nectophores, some of them in excellent condition.

The total absence of basal teeth in both nectophores, combined with the presence of two ventrobasal wings in the superior, one in the inferior, nectophore, make this the most easily recognized species of Galeolaria.

In my earlier discussion (1911b), I suggested that the Indo-Pacific *G. australis*, and the Atlantic *G. biloba*, Sars, would prove to be identical, hesitating to unite them definitely only for want of material from the Atlantic. According to Moser (1913a) they are identical. And the BACHE specimens listed above corroborate this view, for I have been unable to find any distinction between them and series from the North and South Pacific (1911b, 1913).

DIPHYOPSINAE Haeckel.

(*Sensu* Bigelow, 1911b).

This subfamily is abundantly represented in the collection, as of course was to be expected. But the series adds very little to our knowledge of the group, consisting chiefly of superior nectophores of a few well-known species. No eudoxids were found in the material submitted to me. The two genera, Diphyes and Diphyopsis, are retained here, although united by Moser (1912a), because the distinction between the two, presence or absence of special sterile nectophores in the free eudoxid, obviously deserves more importance in classification than the minor differences separating the several species in the two groups.

DIPHYES APPENDICULATA Eschscholtz.

Diphyes appendiculata Eschscholtz, 1829, p. 138, pl. 12, fig. 7.
Diphyes sieboldii Kölliker, 1853, p. 36, taf. 11, fig. 1–8.
?*Diphyes appendiculata* Huxley, 1859, p. 34, pl. 1, fig. 2.
(For synonymy of the polygastric generation, see Bigelow, 1911b, p. 248)

This common Diphyes was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,173, 10,176, 10,178, 10,180, 10,182, 10,184, 10,186, 10,187, 10,188, 10,194, 10,195, 10,196, 10,197, 10,200, 10,203, 10,207, 10,208, 10,209, 10,211, 10,212 both in surface, and in intermediate hauls at various depths. The material consists of several hundred superior nectophores, a few inferior nectophores and one complete specimen.

Moser (1911, 1913a) maintains that the *D. sieboldii* of Kölliker (1853) and Gegenbaur (1854) is not the *D. appendiculata* of Eschscholtz, with which Huxley (1859), and I (1911a, 1911b, 1913,) have united it. That the wide-spread species which I have recorded under the latter name from the North Atlantic (1911a), the West Indies (1911b), the Eastern Tropical and Northwestern Pacific (1911b, 1913), and which is listed above, from the collections of the BACHE, is identical with *D. sieboldii*, there is no doubt: the question at issue is only whether my identification of it as the still older *D. appendiculata* of Eschscholtz (1829) is correct. Owing to the insufficiency of the original account, this must always remain more or less a matter of opinion: no more so, however, in this case than in that of most of the early descriptions of Siphonophorae and Medusae. And so far as it goes, Eschscholtz's figure (1829, taf, 12, fig. 7) agrees very well with the specimens here listed, and those I have recorded earlier, particularly in the outlines of the hydroecium, and in the relative proportions of that organ, of the somatocyst and of the nectosac, in the absence of basal teeth, and in the outlines of the inferior nectophore. Eschscholtz's statement (1829, p. 138), that there are "an der Schwimmhohlseite zwei Kanten" points in the same direction, suppression of the dorsal ridge being a very characteristic feature of the species in question. But his description of the opposite side of the nectophore as having three angles, is not clear.

Questions of this sort are the despair of the student of pelagic coelenterates; but when the probability that identification of an old name is correct, is as strong as in the present case, it should be used, until some actual reason to the contrary is adduced.

Whether the Diphyes described by Huxley (1859) as *D. appendiculata* actually belongs here is certainly open to question, for though his figures agree with it in general form, in the very characteristic outline of the hydroecium, and of the inferior nectophore (particularly its closed hydroecium), he represents and describes the dorsal ridge of the superior nectophore as well developed, whereas in all specimens of *D. appendiculata* recently studied it is suppressed, except at the basal end. Time has proved Huxley's figures so accurate in general, that it certainly is not safe to assume him in error in this instance. This much, however, is sure — either he was dealing with *D. appendiculata*, being deceived as to the extent of the dorsal ridge, or with some Diphyes which has never been seen since, and which differs from *D. appendiculata* only in that ridge, and in the origin of the left lateral ridge at the apex, instead of slightly below it.

Although *D. appendiculata* is one of the commonest and most widespread of siphonophores, and has often been described, the confusion which still obtains in the name to be applied to it makes it desirable to summarize its most diagnostic features here, though a detailed account with figures, has been given elsewhere (Bigelow, 1911b), so that there may be no mistake as to what species is meant.

The superior nectophore has no basal teeth. Its hydroecium reaches upward to about $\frac{1}{6}$ of the length of the nectosac, and is of a peculiar and very characteristic conical outline; basally it extends equally far below the level of the mouth of the nectosac; and its basolateral margins are oblique. The somatocyst is long. There are only three ridges at the apex, two ventral, and the right-lateral. The left-lateral ridge invariably arises some distance below the apex, usually at about the level of the upper end of the nectosac. The dorsal ridge is suppressed except for its basal end.

The hydroecium of the inferior nectophore is closed by the union of its two lateral flaps; there are two basoventral teeth.

Among the many hundreds of specimens, from widely separated localities, which I have examined, I have not found a single variant from any of these characters, and the general outline of the superior nectophore is so characteristic that it identifies *D. appendiculata* at a glance.

Diphyes fowleri Bigelow.

Diphyes fowleri Bigelow, 1911a, p. 346, pl. 28, fig. 5; 1911b, p. 255, pl. 8, fig. 4, pl. 9, fig. 5; 1913, p. 75.
Galeolaria truncata (*partim*) Moser, 1913b, p. 232.

Stations 10,161, 10,163, 10,169, 10,172, 10,178, 10,187, 10,194, 10,207, 10,208, surface and intermediate hauls; about forty superior nectophores, all more or less damaged.

This species is separable from *D. truncata* only by the oval or globular form, and transverse location, of the somatocyst (1911b, 1913). Moser (1913b, p. 232), has united it with *D. truncata*, but until the evidence upon which she does so is available, *D. fowleri* is retained here as a distinct species, no intermediates between the extremes of somatocyst-form illustrated by *D. fowleri* and *D. truncata*, having been actually recorded. Should such prove to occur *D. fowleri* would become a synonym of *D. truncata*.

Diphyopsis dispar (Chamisso and Eysenhardt).

Diphyes dispar Chamisso & Eysenhardt, 1821, p. 365, pl. 33, fig. 4.

To the synonymy given in my former paper (1911b, p. 257), add: —

Doromasia picta Chun, 1888, p. 1154; 1892, p. 8, taf. 8, fig. 3–5, taf. 9, fig. 5–10, taf. 10, fig. 1–7.
Muggiaea bojani Schneider, 1898, p. 88.
Diphyopsis picta Mayer, 1900, p. 75.

This well-known diphyid was taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,176, 10,178, 10,180, 10,182, 10,184, 10,186, 10,187, 10,188, 10,192, 10,194, 10,195, 10,196, 10,197, 10,198, 10,200, 10,203, 10,208, 10,209, 10,211, 10,212; both in surface and intermediate hauls. The series consists of about 200 nectophores, mostly superior. Moser's (1912b) figures of successive stages in the development of *D. dispar* prove conclusively that the *Doromasia picta* Chun is merely a young stage of *D. dispar*, as I have already suggested (1911b, 1913).

It was hardly to be expected that these rather fragmentary nectophores would add anything to our knowledge of the morphology of this species. But in as much as the presence of a set of teeth on the dorsal aspect of the dorsal wall of the hydroecium is characteristic of *D. bojani* (p. 425), I may emphasize that this region is perfectly smooth in all specimens of *D. dispar* which I have examined.

DIPHYOPSIS MITRA (Huxley).

Diphyes mitra Huxley, 1859, p. 6, pl. 1, fig. 4.
(For synonymy see Bigelow, 1911b, p. 258).

Diphyopsis mitra proved to be one of the commonest siphonophores in the collection, being taken at Stations 10,161, 10,162, 10,163, 10,166, 10,169, 10,171, 10,172, 10,173, 10,176, 10,178, 10,180, 10,182, 10,186, 10,187, 10,192, 10,194, 10,195, 10,197, 10,200, 10,203, 10,207, 10,208, 10,209, 10,211, 10,212; in both surface and intermediate hauls. The material consists of upwards of 400 superior nectophores, all more or less fragmentary.

It is surprising that a species as well characterized and as common in the warmer parts of the Atlantic as is *D. mitra* should so long have been overlooked there, its first definite record from that ocean being in 1911 (Bigelow, 1911b, p. 259). Since that time, however, it has been found in numbers not only among the West Indies and in the region traversed by the BACHE, but widely distributed over the tropical Atlantic (Moser, 1913a).

Its size and general outlines are such that it has probably been often confused with *D. appendiculata*. Hence though it is in reality one of the most easily recognized members of the group, and has already been described and figured by me in detail (1911b), its diagnostic features are briefly summarized below.

The diagnostic characters of the superior nectophore are its high, symetrically pyramidal, form, with five ridges running from apex to base; small dorsobasal, but no laterobasal teeth; hydroecium longer below than above the opening of the nectosac, truncate at its apex;

somatocyst short, reaching only to mid-level of nectosac; dorsobasal wall of hydroecium divided into two wings, the left hand one bearing a secondary triangular flap or tooth near its inner margin.

And I have found no variation from these characters in any of the numerous specimens, Atlantic, and Pacific, which I have examined.

The inferior nectophore resembles that of *Diphyes appendiculata;* but is easily distinguished from it by the fact that its hydroecium is open from end to end (1911b, pl. 10, fig. 5).

The location of this species in Diphyopsis rather than in Diphyes rests on the statement by Lens and Van Riemsdijk (1908, p, 51), that the oldest group of appendages in one of their specimens "showed clearly a bud of a special gonocalyx." But if Moser (1913, p. 147) be correct, this cannot have been the case, for she says that the eudoxid without special nectophores, referred by Lens and Van Riemsdijk and by me to *Diphyes appendiculata,* really belongs to *D. mitra,* which would then be a Diphyes. My own studies throw no light on this question, for the specimens of *D. mitra* which I have seen have only young cormidia, or have lost all but the base of the stem. Hence judgment must be suspended until the evidence on which she bases her identification of the eudoxid in question is available.

DIPHYOPSIS BOJANI (Eschscholtz).

Plate 8, fig. 3, 4.

Eudoxia bojani Eschscholtz, 1825, p. 743, taf. 5, fig. 15; 1829, p. 125, taf. 12, fig. 1 (eudoxid); Huxley, 1859, p. 59, pl. 3, fig. 7.

Diphyes steenstrupi Gegenbaur, 1860, p. 369, taf. 29, fig. 27–29; Chun, 1879b, p. 103; Lens & Van Riemsdijk, 1908, p. 44; Bigelow, 1911b, p. 347; Moser, 1911, p. 431.

Cuculus gracilis Haeckel, 1888b, p. 110 (eudoxid).

Ersaea dispar Haeckel, 1888b, p. 361.

Ersaea bojani Chun, 1888a, p. 1154; 1892, p. 108, fig. 7; Lens & Van Riemsdijk, 1908, p. 6, fig. 1–6; Bigelow, 1911b, p. 264, pl. 11, fig. 7, 8 (eudoxid).

Diphyes serrata Chun, 1888, p. 1158; 1897b, p. 26; Lens & Van Riemsdijk, 1908, p. 44; Bigelow, 1911b, p. 347.

Eudoxia serrata Chun, 1888, p. 1159; 1897b, p. 26 (eudoxid).

Doromasia bojani Chun, 1892, p. 108, 110, fig. 8.

Ersaea picta Chun, 1892, p. 98, fig. 6, pl. 11, fig. 8 (eudoxid).

Diphyes indica Lens & Van Riemsdijk, 1908, p. 45, pl. 7, fig. 55, 56.

Diphyes gegenbauri Lens & Van Riemsdijk, 1908, p. 46, pl. 7, fig. 57, pl. 8, fig. 58.

Doromasia pictoides Lens & Van Riemsdijk, 1908, p. 3, pl. 1, fig. 1.
Diphyes bojani Bigelow, 1911b, p. 251, pl. 7, fig. 2, 3, pl. 8, fig. 6, pl. 9, fig. 1, 2, pl. 10, fig. 2, 3, pl. 11, fig. 7, pl. 12, fig. 1; 1917, p. 306; Moser, 1913a, p. 233; 1913b, p. 146.

D. bojani was taken at Stations 10,161, 10,162, 10,163. 10,166, 10,169, 10,171, 10,176, 10,178, 10,180, 10,186, 10,187, 10,188, 10,192, 10,194, 10,197, 10,200, 10,203, 10,207, 10,208, 10,209, 10,210, 10,211, 10,212, both on the surface and in intermediate hauls with open nets, at various depths down to 600 meters. The material consists of upwards of 200 superior nectophores, and a few inferior nectophores.

It is now well established that the Atlantic *D. steenstrupi* Gegenbaur, (*D. serrata* Chun) is identical with the Pacific *D. bojani* Moser, 1911, p. 431; 1913a, p. 146). The use of the name *D. bojani*, instead of *D. steenstrupi*, for this combined species depends on the strong probability that the *Eudoxia bojani* of Eschscholtz is its eudoxid (Moser, 1911, p. 431). But if this is the case, it is a Diphyopsis, not a Diphyes as I formerly supposed, the eudoxid in question having sterile swimming bells as well as gonophores.

The general features of *D. bojani* are well known; the base of the upper nectophore is figured here (Plate 8, fig. 3) in as much as the small teeth on the dorsal wall of the hydroecium are, as noted by Gegenbaur (1860), the most diagnostic difference between *D. bojani* and *D. dispar*. These were overlooked by me in my account of the Eastern Pacific series (1911b).[1]

These teeth are situated on a vertical crest, rising from the dorsal surface of the dorsal wall of the hydroecium, near its basal margin (Plate 8, fig. 3, 4), well described by Gegenbaur as a "gezahnelte senkrechte Kante" (1860, p. 40), and they, and the crest which bears them, occur in all the specimens of *D. bojani* which I have examined, Atlantic and Pacific, though they vary in size, and in number, from 2–5.

CHUNIPHYES MULTIDENTATA Lens AND Van Riemsdijk.

Chuniphyes multidentata Lens & Van Riemsdijk, 1908, p. 13, pl. 1, fig. 9–11, pl. 2, fig. 12–15; Bigelow, 1911a, p. 348; 1911b, p. 262, pl. 8, fig. 9, pl. 10, fig. 7, pl. 12, fig. 6; 1913, p. 73.

Station 10,172, 1800–0 meters, three superior, two inferior nectophores, all about 19 mm. long.

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[1] This was called to my attention by Dr. Moser.

The material is so fragmentary that it adds nothing to my earlier discussion of this species. In the one superior nectophore in which the somatocyst is still intact, the median dilation of this organ consists of two short transverse horns, as I have already recorded it for specimens from the Bay of Biscay (1911a), and from the northwestern Pacific (1913).

AGALMIDAE Brandt.

AGALMA OKENI Eschscholtz.

Agalma okeni Eschscholtz, 1825, p. 744, pl. 5, fig. 17.
(For synonymy, see Bigelow, 1911b, p. 277).

This species was taken at Stations 10,162, 10,163, 10,166, 10,171, 10,176, 10,180, 10,186, 10,188, 10,192, 10,194, 10,195, 10,196, 10,197, 10,198, 10,200, 10,202, 10,203, 10,208, 10,209, 10,211. The material consists of about sixty colonies (or parts of colonies), and a large number of detached nectophores and bracts. I have been able to compare these specimens with series from various parts of the Pacific.

Agalma okeni is perhaps the most easily recognized of all agalmids, owing to its short, stiff stem, large tricornuate involucrate tentilla, thick, prismatic bracts, and flat, firm nectophores. Indeed so diagnostic are the bracts and nectophores, that they are not likely to be confused with any other agalmid, even when found detached in the plankton. As *A. okeni* has recently been described and figured in detail by Haeckel (1888b, "*Crystallodes vitreus*"), by Lens and Van Riemsdijk (1908), and by me (1911b) no account is needed here, further than to point out that the BACHE collection contains the largest example yet recorded, 115 mm. long after preservation, with nineteen siphons and at least thirty-three nectophores.

STEPHANOMIA RUBRA (Vogt).

Plate **8**, fig. 5.

Agalma rubra Vogt, 1852, p. 522; 1854, p. 62, taf. 7–11.
(For synonymy, see Bigelow, 1911b, p. 348).

Station 10,166, 100–0 meters, one very fragmentary specimen, much contracted.

Station 10,206, 400–0 meters, one very fragmentary specimen, much contracted.

Loose bracts, and nectophores, all in poor condition, from Stations 10,161, 10,169, 10,180, 10,194, 10,208, 10,209, 10,211, probably belong to this species also.

The identity of these two specimens rests on the fact that the tentilla (Plate 8, fig. 5) a few of which are intact in each case, have a single terminal filament, and no involucre, for *S. rubra* is the only agalmid with this type of tentillum (1911b), and on actual comparison with two excellent examples of the species from Naples.

Two young bracts, still attached to the specimen from Station 10,166, are of the thin, foliaceous, triangular form typical of that species (Vogt, 1854; Leuckart, 1854; Kolliker, 1853); and two young nectophores (specimen from Station 10,206) are higher and more rounded than the corresponding organs in *Agalma okeni*, in this agreeing with the Naples specimens of *S. rubra*. It is because of their resemblance to the latter, that the nectophores and bracts listed above are referred to *S. rubra*. But though they are easily separated from the corresponding organs of *Agalma okeni*, they so closely resemble *Agalma elegans*, and *Stephanomia bijuga* (1911b), both of which may be expected to occur in the region traversed by the BACHE, that possibly one, or even both, of those species may actually be represented among these loose bells.

The material is so fragmentary, that it adds nothing to the earlier accounts of this species.

RHIZOPHYSIDAE Brandt.

RHIZOPHYSA FILIFORMIS (Forskål).

Physsophora filiformis Forskål, 1775, p. 120; 1776, tab. 33, fig. f. (For synonymy, see Bigelow, 1911b, p. 319).

Station				
10,169	50–0	meters	1	fragmentary specimen
10,188	175–0	"	1	" "
10,205	100–0	"	1	" "

These specimens are fragmentary, and very much twisted. But the presence of trifid tentilla identifies them as *R. filiformis* rather than *R. eysenhardti*.

VELELLIDAE Brandt.

VELELLA VELELLA (Linné).

Medusa velella Linné, 1758, p. 660.
(For synonymy, see Bigelow, 1911b, p. 353).

The common Velella was taken at Stations 10,163, 10,200, 10,207 a total of about twenty specimens, ranging in length from 5–50 mm.

GEOGRAPHICAL DISTRIBUTION.

Considerable interest naturally attaches to the *first* collection of animals of any group from an oceanic area, even though there be nothing in depth, temperature, salinity, or locality, to presuppose important faunal differences from neighboring regions. The collections obtained by the BACHE are a case in point, for while many pelagic coelenterates are known from the American and West Indian coastal waters, and from the inner margin of the Gulf Stream on the one hand; from Bermuda and the tropical Atlantic on the other, there are practically no previous records of Medusae or Siphonophorae from the oceanic triangle between Cape Hatteras, Bermuda, and the Bahamas. This, as a glance at a chart will show, is a characteristically oceanic region, and as such, general knowledge of the distribution of pelagic animals makes it safe to predict that the characters of its medusan and siphonophore fauna will depend directly on its physical characteristics. Although this part of the oceanic basin is north of the tropics in latitude (27°–35° N.), its mean annual temperature is upwards of 22° C. on the surface waters, (Schott, 1902, taf. 9), cooling to about 19°–20° in mid-winter; 18° or higher at 200 meters (1917; Schott, 1902, 1912). And its salinity, 36‰ or more at all depths down to 500 meters (1917a; Schott, 1902, 1912), is correspondingly high. But this warm salt ocean water contrasts very sharply with the low temperatures and salinities of the coast water on the continental shelf, on the one hand, and on the other with the North Atlantic abyssal water (3.5°–4°; about 34.9‰), at and below 1,800 meters (1915, 1917).

The Florida, and the Antilles currents both skirt the region in question, the former bringing the water of the Gulf of Mexico, with its denizens, through the Straits of Florida; the latter following the Bahama Bank; beyond which they merge, as the Gulf Stream, to follow the continental slope northward. As is well known, the main axis of this great current lies close to the slope; while the waters immediately west and southwest of Bermuda, on the contrary, are part of the eddy which occupies the central portions of the North Atlantic (Deutsche seewarte, 1882; Schott, 1902; 1912; Soley, 1911).

On oceanographic grounds the pelagic coelenterate fauna of the Cape Hatteras-Bermuda-Bahamas triangle might be expected to consist of the following elements: —

1. Neritic Medusae, reaching the ocean basin as immigrants from the Bahamas, West Indies, Gulf of Mexico, and American coast on the one hand; from Bermuda, perhaps even from the eastern side of the tropical Atlantic, via the equatorial drift and Antilles current, on the other.

2. The warm water holoplanktonic Medusae and Siphonophorae, which range, undifferentiated, over the entire tropical and subtropical zones of all three great oceans, Atlantic, Indian, and Pacific (1909a, Vanhöffen, 1902).

3. Cosmopolitan holoplanktonic forms; *i. e.*, those whose distribution is independent of temperature.

4. Species at home, not on the surface, but in the low temperatures, and dim light of the intermediate, or even abyssal, depths, most at least, of which, are practically cosmopolitan over the ocean basins.

5. Cold water forms; stragglers from the north.

The neritic, and holoplanktonic categories, it is true, are connected with each other by such Medusae as prolong the interval between fixed (hydroid) stage and fixed stage through the medium of one or more budding phases; nor can hard and fast lines be drawn between any of the groups. But they afford a convenient working classification.

The Bache collection contains the following typically neritic Medusae; *Stomotoca pterophylla, Pandea conica, Laodicea cruciata, Aequorea aequorea, Nausithoë punctata,* while *Charybdea marsupialis* var. *xaymachana, C. alata, Linuche unguiculata, Calycopsis papillata* and *Eutiara mayeri* probably belong here also. But most of these were taken at only one or two stations each, either in the Gulf Stream close to the Continental Slope (Station 10,161), in the Straits of Florida, or off the Bahama Bank within the sweep of the Antilles current (Station 10,211). And only twice were neritic Medusae taken far from land, a *Pandea conica* at Station 10,171, a *Charydea marsupialis* at Station 10,188. The records of previous deep-sea expeditions have established the rarity of neritic Medusae in the high seas as a general rule (Maas, 1893). But the fact that it is as true of the region west and southwest of Bermuda as of the central Atlantic or Pacific, contrasted with the rich neritic fauna of the Bahamas (Mayer, 1904), the straits of Florida (Mayer, 1900, Vanhöffen, 1913), and even of Bermuda, has a special interest because of the close proximity of the Antilles and Florida currents. These, or the product of them combined, annually transport, perhaps are constantly transporting, many of the West Indian Medusae northward for long distances. And though the extreme northern limit to this migration is unknown, forms which certainly began their journey as far south as Florida, have often been taken in the inner edge of the Gulf Stream off Cape Cod. But since the BACHE records do not reveal any tendency toward dispersal seaward from the land, this migration is apparently confined to a fairly definite track close to the continental slope, at least in winter, which corresponds to the absence of any dominant surface drift either from the continental shelf toward Bermuda, or *vice versa*. But the fact that the neritic Medusae of Bermuda, are, as a whole, practically an impoverished Bahaman fauna, including such unmistakably American species as *Halitiara formosa*, *Eirene pyramidalis*, and *Aequorea floridanus*, is evidence of occasional transfers from the coast eastward across the intervening ocean. Whether, however, this process is going on sporadically today, is by no means certain, for similarity of neritic Medusae does not necessarily mean a present interchange, as witness the conditions on the two sides of Central America (1909a).

The BACHE list includes two species of Anthomedusae made practically holoplanktonic by a budding phase, *i. e.*, *Cytacis tetrastyla* and *Bougainvillea niobe*.

Cytaeis is now known to occur very generally, although irregularly, over all warm waters, Mediterranean, Atlantic, Pacific, and Indian (1909a; Vanhöffen, 1911, 1912a), a distribution indicating that the intervals between successive hydroid stages are sufficiently prolonged, by the medium of one or more budding phases, to allow unlimited dispersal in the waters suited to it by temperature. But though Cytaeis is thus enabled to surmount the barrier which the ocean basins impose to the dispersal of neritic Medusae, it has not attained the uniformity of distribution characteristic of such truly holoplanktonic coelenterates as *Rhopalonema velatum*, *Liriope tetraphylla*, or *Diphyes appendiculata*.

Bougainvillea niobe, previously known only from the Bahamas (Mayer, 1900, 1904, 1910) and from one station in the south Atlantic

(Vanhöffen, 1912, p. 359), occurred, very generally, over the area studied by the Bache (p. 368), with the sole exception of the cold coast water off Chesapeake Bay, but nowhere in large numbers. And as pointed out (p. 369), the series contains both budding and sexual phases. The area in question is probably chiefly peopled with Bougainvillea from the Bahamas, but perhaps from Bermuda also.

The occurrence of *Bougainvillea niobe* in the south Atlantic (25° S.) of course suggests that it ranges as widely in that ocean as does Cytaeis. But opposed to this possibility is the fact that it was not found at any of the numerous stations of the Plankton or Valdivia expeditions in the north and south Atlantic (Maas, 1893, Vanhöffen, 1913b); and that it is not known from the inner edge of the Gulf Stream off New England on the one hand, or from the Canary Islands, or the Mediterranean, on the other. Its absence in the central part of the Atlantic may be a seasonal phenomenon, for while most of its records are for winter or early spring (January to March), plankton hauls on the high seas have been usually taken in summer. And this is made the more likely by its presence in the inner edge of the Gulf Stream off Chesapeake Bay in January (Station, 10,161), contrasted with its absence there and at corresponding localities further north, in summer (1915, 1917b). But its absence in European waters, especially in the Mediterranean, can not be explained on seasonal grounds, nor can the failure of recent deep-sea expeditions to find it in the Pacific or Indian Oceans. I believe the true explanation to be that this fundamentally American species is enabled by its budding phase to spread over the western side of the tropical Atlantic; but that the interval between successive hydroid-stages is not long enough for it to attain a wider dispersal.

The Bache list includes the following warm water holoplanktonic Medusae: — *Aglaura hemistoma, Liriope tetraphylla, Geryonia proboscidalis, Rhopalonema velatum, Cunina peregrina, Pegantha clara, Pegantha dactyletra,* and *Solmundella bitentaculata.* And all of the siphonophores, except two new species, of whose faunal relationships nothing is known, and the few cosmopolitan forms (p. 434), likewise belong to this category. Most of these Medusae were already known to have very wide range, Rhopalonema, Aglaura, Liriope, Geryonia, and Solmundella being practically universal throughout the warmer parts of all three great oceans; while *Pegantha clara,* and probably *P. dactyletra,* have been recorded from both the Atlantic and the Pacific. *Cunina peregrina* was previously known from the Pacific only. But as it covers a very wide range there (Bigelow, 1909a, 1913;

Maas, 1909), there is nothing surprising in its occurrence in the tropical Atlantic as well. And the Siphonophorae collected by the BACHE are not only similarly universal, within their temperature limits, in all oceans (1911b; Moser, 1913a, 1913b, 1915), but most of them are already known from the West Indies, the Bahamas, the Tortugas, Bermuda, or the Gulf Stream. The only new siphonophore records for the region in question from the BACHE list are *Vogtia pentacantha*, *Vogtia glabra*, *Abyla dentata*, *Ceratocymba sagittata*, *Galeolaria australis*, Chuniphyes and *Stephanomia rubra*. But all of these, except the two new species, and *Galeolaria quadridentata* for which no locality has ever been given, are already known from some part of the Atlantic. Thus *Vogtia pentacantha* has been recorded from the Bay of Biscay (Bigelow, 1911a), from the central and south Atlantic, and from the Antarctic (Moser, 1913a, p. 146); *Galeolaria monoica* from the Canaries (Chun, 1888); *Galeolaria australis* from Greenland and from the north and south Atlantic (Bigelow, 1911b, "*G. biloba*"; Moser, 1913a, p. 148), Chuniphyes from the Bay of Biscay (1911a); while *Ceratocymba sagittata* is recorded by Moser (1913a, p. 149) as taken repeatedly by the GAUSS. And though *Stephanomia rubra* has not previously been recorded from the Atlantic, so far as I can learn, it is known from such widely separated localities as the Mediterranean and the Island of Amboina (Bedot, 1896). In short, there is nothing surprising in the capture of any of these holoplanktonic Medusae or Siphonophorae by the BACHE. However, the records have the value of actually filling in a blank on the map, to which their ranges could previously be extended by inference only.

A characteristic example of the holoplanktonic habit, which may serve to illustrate them all in the Atlantic, is afforded by *Rhopalonema velatum*, which has been found all along the routes of the various deep-sea expeditions of recent years, and in the Mediterranean as well (Fig. 1). Its most northern records are from off the Grand Banks on the west, the Bay of Biscay on the east (Browne and Fowler, 1906). And it would not be surprising to find it carried even further north in the warm currents in summer, especially off the European coast as happens with so many other pelagic animals.

Between 30° S.; and 40° N. in the Atlantic high seas it is practically universal except in the cool coast water off eastern North America, the only other important gaps in its range being the localities where few, or no, plankton hauls have yet been made. In terms of temperature, the normal limits to its range about coincide with the surface isotherms for 18° C., for the warmer months. And it, or any of the

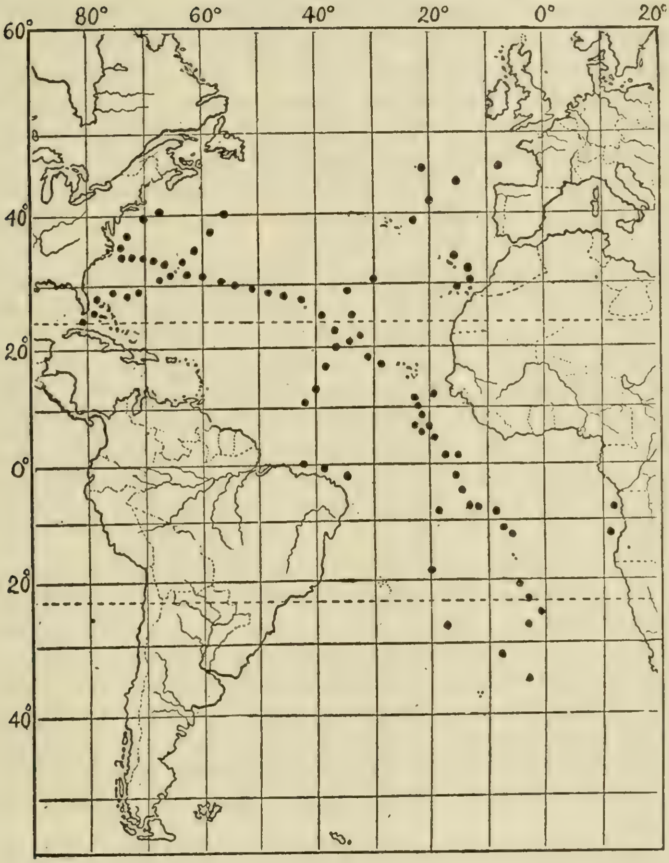
80°
60°
40°
20°
0°
20°
60°
40°
20°
0°
20°
40°

Fig. 1.— Records for *Rhopalonema velatum.*

other warm water holoplanktonic Medusae or Siphonophorae, may be expected anywhere within the isotherms of 20°, except in coastal waters of low salinity.

Off our coasts, north of Chesapeake Bay, the continental slope, *i. e.*, the line of demarcation between Atlantic and coastal water, is roughly the normal western limit to all these holoplanktonic species, though they may sporadically reach the coast. In the coast water the place of the holoplanktonic Medusae is taken by a host of neritic species. But only one siphonophore, *Stephanomia cara*, is anything but accidental there between Chesapeake Bay and Nova Scotia; and even that one species is irregular and sporadic in its occurrence. Probably for siphonophores as a whole the low salinity of the coast water is an effective barrier (1911b).

The holoplanktonic coelenterate fauna proved to be as uniform quantitatively throughout the area traversed by the BACHE (except for the cold coast water), as it is over the tropical oceans as a whole, there being no such contrast between the ocean currents and the more stagnant neighboring water as obtains for the eastern Pacific (Bigelow, 1909a, 1911b). Thus Rhopalonema, Bougainvillea, *Diphyopsis bojani*, Ceratocymba, and *Abylopsis tetragona*, were taken at two thirds or more of the thirty-three tow-net stations, while Hippopodius, *Diphyopsis dispar*, and *Diphyes appendiculata* occurred at nearly every station.

There are no cosmopolitan surface Medusae in the BACHE list: but two examples of this habit are afforded by the siphonophores *Galeolaria australis* and *Vogtia pentacantha;* possibly a third, if *Diphyes fowleri* proves to be a synonym of *D. truncata* (p. 422).

Considering the number of comparatively deep tow-net hauls made by the BACHE surprisingly few deep-sea coelenterates were captured; only one young Periphylla (p. 401) and a small series of *Chuniphyes multidentata* (p. 425). Both of these have already been recorded from the Atlantic (Bigelow, 1911b; Broch. 1913), the former on many occasions.

Stragglers from the north are represented by *Aglantha digitale*, the occurrence of which in the coast water off Chesapeake Bay deserves note, because this is the most southerly record of this species in the Atlantic (Maas, 1906b; Mayer, 1910; Bigelow, 1917b).

TABLE OF STATIONS.

Stations	Lat. N.	Long. W.
Off Chesapeake Bay		
10,158	36°12′	74°25′
Line Chesapeake Bay to Bermuda		
10,161	35°27′	73°14′
10,162	34°41′	73°23′
10,163	33°22′	73°37′
10,166	32°33′	72°14′
10,169	32°29′	71°29′
10,171	32°27′	69°55′
10,172	32°26′	69°21′
10,173	32°27′	68°22′
10,176	32°30′	65°48′
Off Bermuda		
10,178	32°20′	64°21′
10,180	31°52′	65°14′
Line Bermuda toward Bahamas		
10,182	30°27′	66°05′
10,184	29°17′	67°07′
10,186	29°15′	68°35′
10,187	28°59′	69°22′
10,188	28°51′	70°08′
10,192	28°35′	73°33′
10,194	28°51′	75°13′
10,195	29°	76°23′
N. E. Providence Channel		
10196	25°27′	77°16′
Straits of Florida		
10,197	24°18′	81°50′
10,198	23°59′	81°50′
10,200	23°32′	81°48′
10,202	25°34′	79°24′
10,203	25°34′	79°42′
10,205	27°05′	79°52′
10,206	27°17′	79°40′
10,207	27°32′	79°21′
North of Bahama Bank		
10,208	27°46′	78°46′
10,209	27°57′	78°15′
10,210	27°59′	77°25′
10,211	28°08′	76°48′
10,212	28°10′	76°18′

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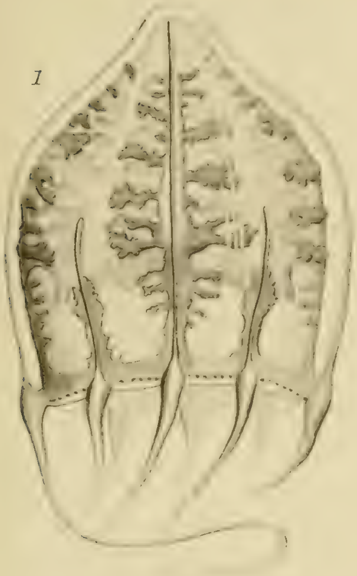
EXPLANATION OF THE PLATES.

PLATE 1.

PLATE 1.

Eutiara mayeri Bigelow.

Fig. 1. Side view of type-specimen.
Fig. 2. Upper portion of bell, with bell-wall spread open, to show the gonads.
Fig. 3. Portion of margin, showing two large tentacles, small tentacles, and exumbral ribs.
Fig. 4. Aboral view of portion of margin, much enlarged, to show two small tentacles, with their pigment.
Fig. 5. Segment of margin, in side view, showing a small tentacle with its pigment, circular canal, and velum.



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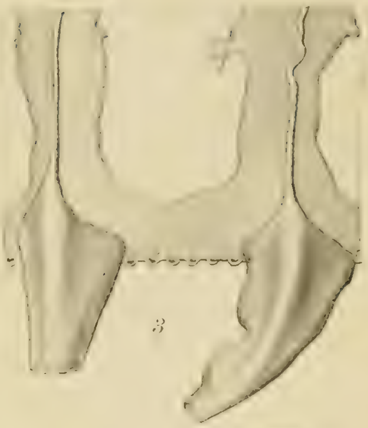

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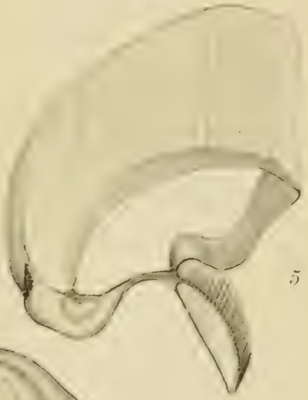

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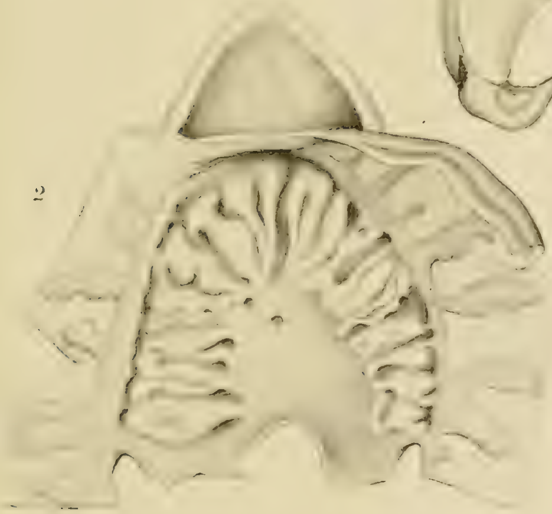

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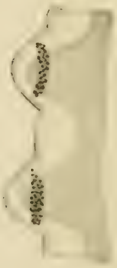

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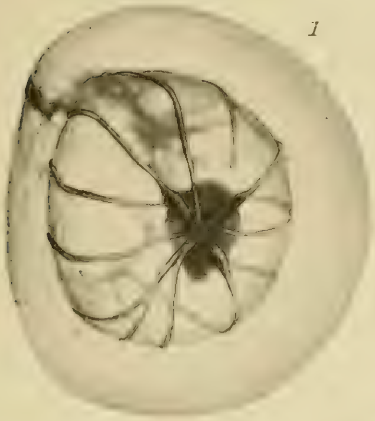
PLATE 2.

PLATE 2.

Calycopsis papillata Bigelow. From photographs.

Fig. 1. Aboral view of type-specimen.
Fig. 2. Aboral view of portion of margin.
Fig. 3. Side view of a segment of the margin.
Fig. 4. Manubrium of type-specimen, to show gonads.
Fig. 5. Aboral view of specimen 11 mm. high.
Fig. 6. Side view of specimen 11 mm. high.
Fig. 7. Aboral view of specimen 18 mm. high.



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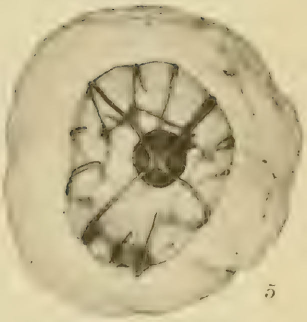

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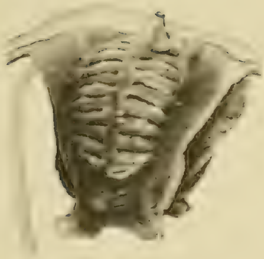

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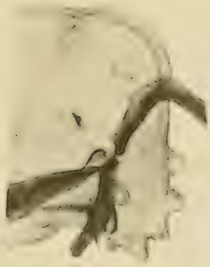

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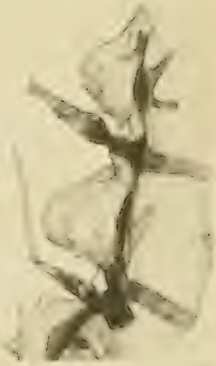

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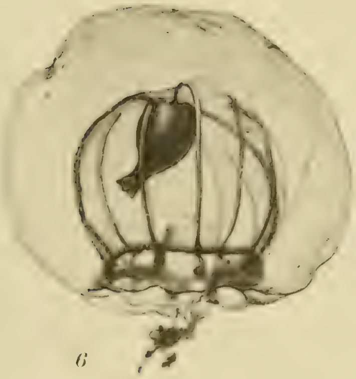

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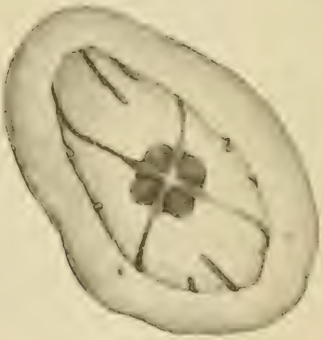

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PLATE 3.

PLATE 3.

Calyopsis papillata Bigelow.

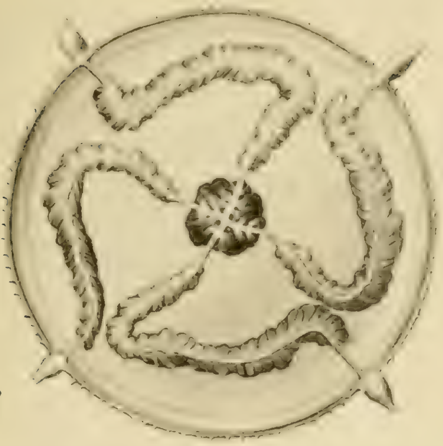
Fig. 1. Side view of type-specimen, with the side of the bell cut away, to show canals and manubrium. From a photograph.

Cyclocanna welshi Bigelow.

Fig. 2. Aboral view of type-specimen.
Fig. 3. Side view of manubrium, and basal part of one of the radial canals, with its gonad, of type.
Fig. 4. Aboral view of margin of type, to show large and small tentacles.
Fig. 5. Aboral view of small tentacle, showing pigmentation.

Eutiara mayeri Bigelow.

Fig. 6. Section of bell-wall, and one of the hollow exumbral ribs.



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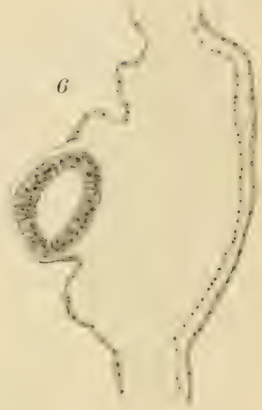

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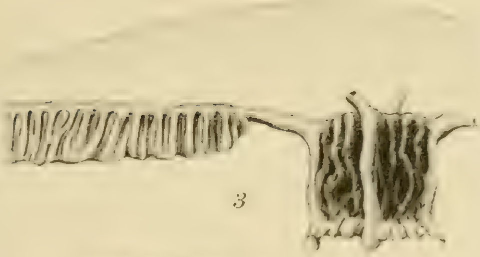

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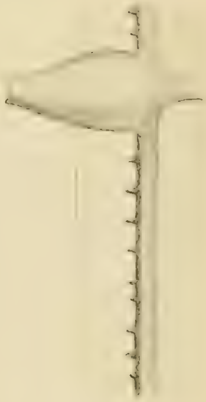

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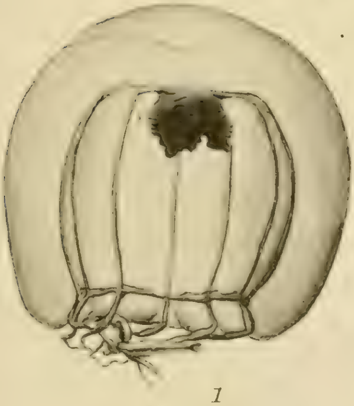

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PLATE 4.

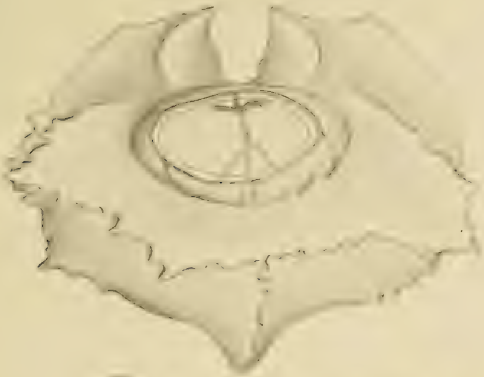
PLATE 4.

Vogtia pentacantha Kölliker.

Fig. 1. Dorsal view of an adult nectophore.

Vogtia glabra Bigelow.

Fig. 2. Dorsal view of young nectophore, 7 mm. long. Type-specimen.
Fig. 3. Ventral view of same.
Fig. 4. Dorsal view of older nectophore, 17 mm. long.
Fig. 5. Adult nectophore, 30 mm. broad; dorsal view.
Fig. 6. Young tentillum.
Fig. 7. Adult tentillum.



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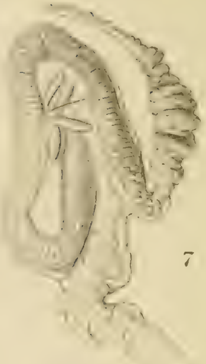

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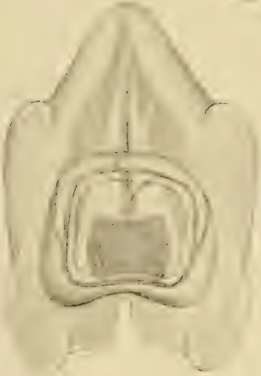

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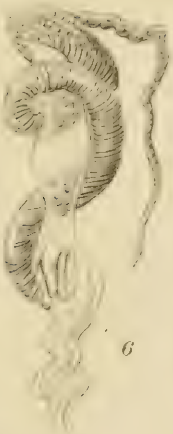

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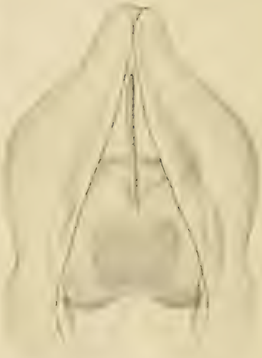

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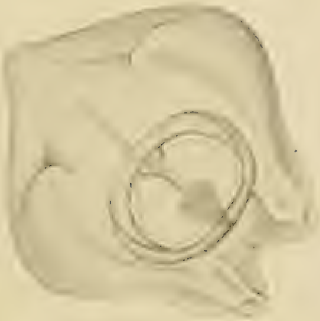

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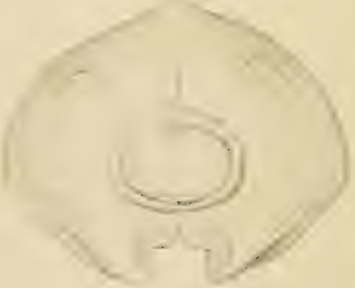

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PLATE 5.

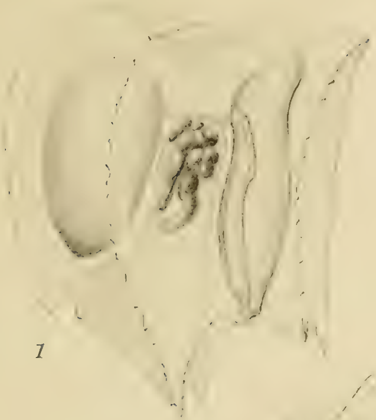
PLATE 5.

Abyla dentata Bigelow.

Fig. 1. Side view of superior nectophore. Type-specimen.
Fig. 2. Ventral view of same.
Fig. 3. Dorsal view of same.
Fig. 4. Apical view of same.

Ceratocymba sagittata (Quoy & Gaimard).

Fig. 5. Dorsal view of bract of free eudoxid, 16 mm. long.



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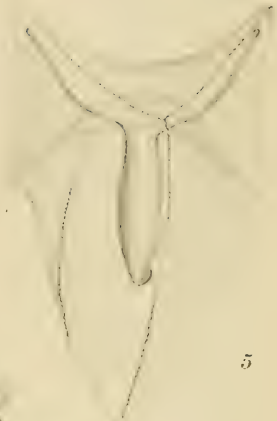

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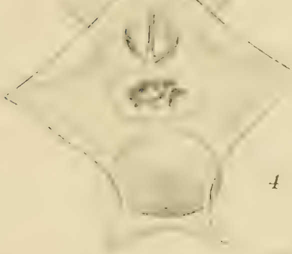

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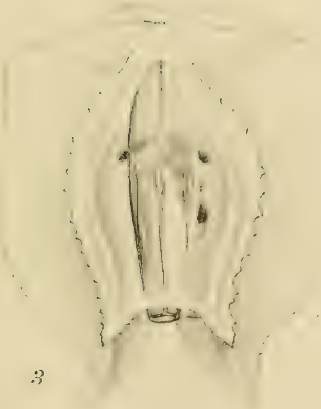

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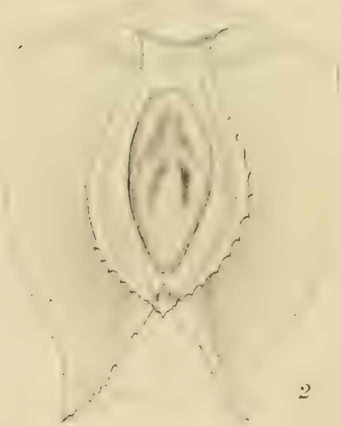

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PLATE 6.

PLATE 6.

Ceratocymba sagittata (Quoy & Gaimard).

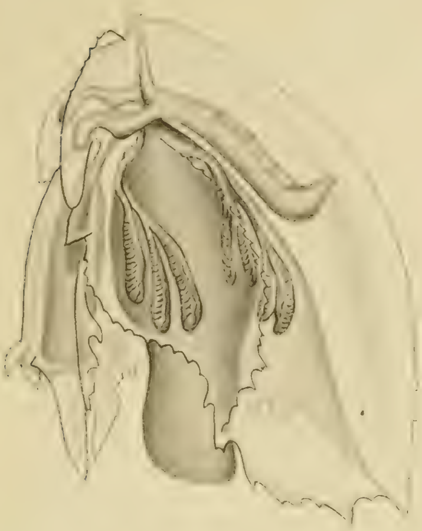
Fig. 1. Group of appendages, still attached to the stem (see p. 414).

Fig. 2. Male gonophore of same, more enlarged, from left side.

Fig. 3. Female gonophore 30 mm. long, from free eudoxid, seen from right side.

Abyla leuckartii Huxley.

Fig. 4. Female gonophore 8 mm. long, from free eudoxid, Albatross Station 4,469, Eastern Pacific.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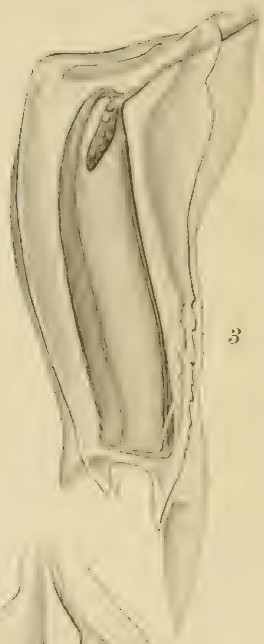
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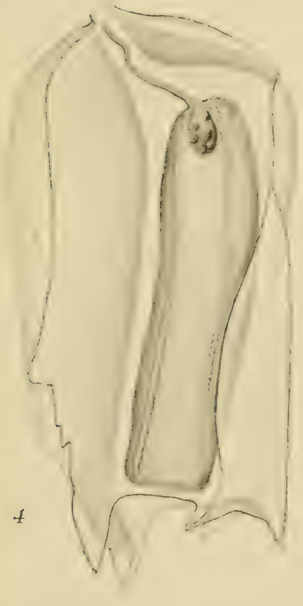
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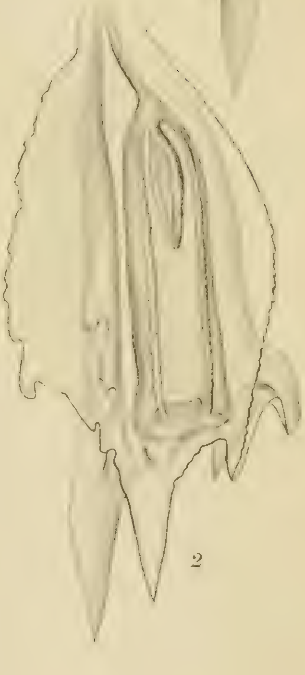
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PLATE 7.

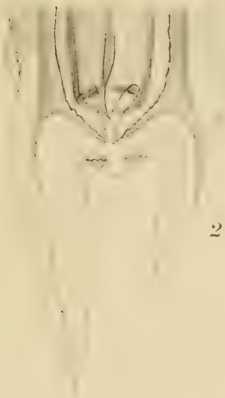
PLATE 7.

Ceratocymba sagittata (Quoy & Gaimard).

Fig. 1. Inferior nectophore, 45 mm. long, seen somewhat obliquely from the left side.
Fig. 2. Dorsal view of base of female gonophore, 15 mm. long, from free eudoxid.
Fig. 3. Similar view of male gonophore, 11 mm. long, from free eudoxid.
Fig. 4. Cross-section of female gonophore 35 mm. long.
Fig. 5. Cross-section of male gonophore 30 mm. long.

Hippopodius hippopus (Forskål).

Fig. 6. Young tentillum.
Fig. 7. Adult tentillum.



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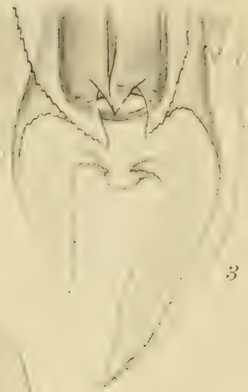

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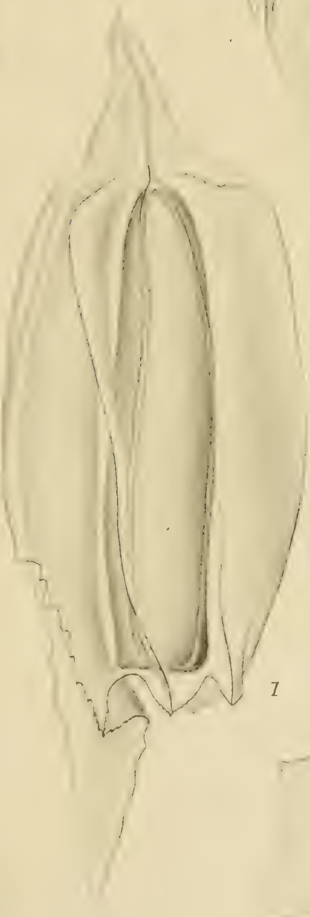

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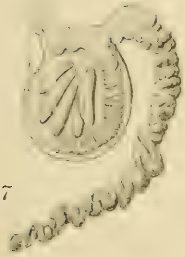

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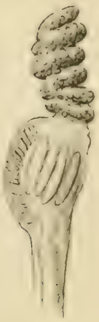

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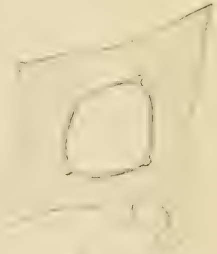

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PLATE 8.

PLATE 8.

Galeolaria quadridentata (Quoy & Gaimard).

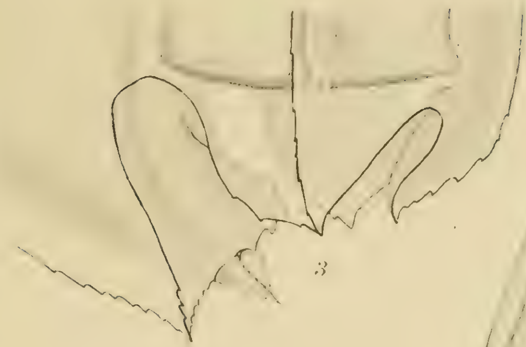
Fig. 1. Side view of superior nectophore, 12 mm. long.
Fig. 2. Basal view of same.

Diphyopsis bojani (Eschscholtz).

Fig. 3. Left lateral view of base of superior nectophore.
Fig. 4. Dorsal view of same.

Stephanomia rubra (Vogt).

Fig. 5. Adult tentillum.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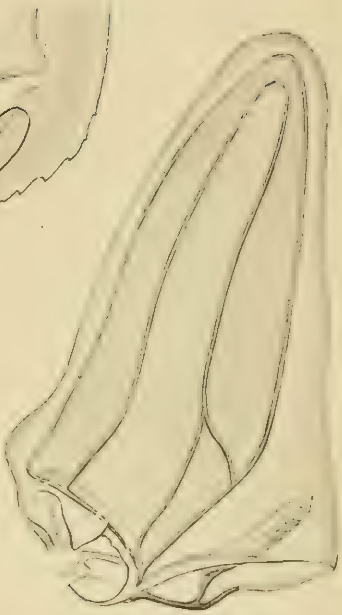
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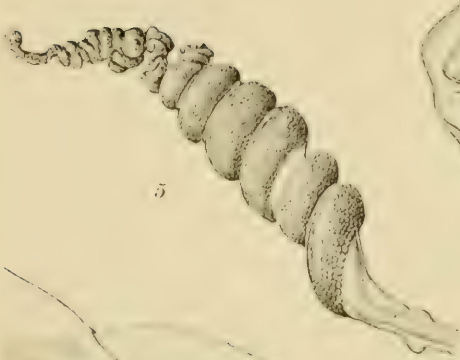
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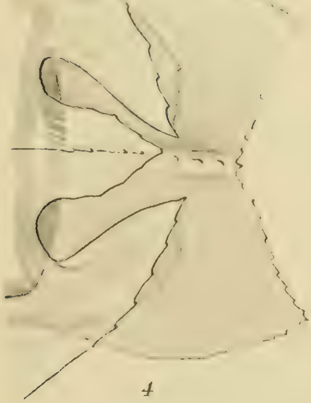
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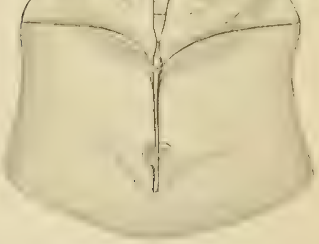
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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXII. No. 9.

THE COLLECTION OF AMPHIBIA CAUDATA OF THE MUSEUM OF COMPARATIVE ZOÖLOGY.

By Emmett R. Dunn.

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM.
December, 1918.

No. 9.— *The Collection of Amphibia Caudata of the Museum of Comparative Zoology.*

By Emmett R. Dunn.

This paper records some of the results of a recent study of the M. C. Z. collection of tailed amphibians. The localities, Museum catalogue number, and the number of specimens (in parentheses) are given under each form. The enumeration is complete to October, 1918. The collection contains 86 species or subspecies and 2,703 specimens. The records enclosed in square brackets have been supplied by Dr. Thomas Barbour.

NECTURIDAE.

1. Necturus maculosus (Rafinesque).

Loc. ? 1,820; 4,709.— Lake Champlain, 276 (2); 1,061 (2); 1,844 (*skull*).— N. Y.: Cayuga Lake, 1,282; 1,861 (14); 2,010 (17); Ithaca, 1,371 (2); 1,713 (2); [Rochester, 313 (3)].— Ohio: Sandusky River, 1,849 (4).— Mich.: Antrim Co., Torch Lake, 2,447; 4,708; Northport, 4,271.

M. C. Z. 2,010 includes a series ranging from 83–320 mm. in length. The smaller ones, as well as 2,447 and 1,820 (53 mm. long) show a most distinct striping, in the form of a median and two lateral dark stripes. These persist in the adult in the dark line through the eye, but elsewhere on the body they disappear and are replaced by numerous spots.

2. Necturus punctatus (Gibbes).

S. C.: Santee River, 1,553 (cotype).

This specimen is 150 mm. long. It is slimmer than N. *maculosus* of equal length, and lacks all trace of stripes, even the black line through the eye. There are no spots.

I have examined about fifteen specimens of this form, from Wilmington, N. C., Ogden and Charleston, S. C., and the Little Pedee and Santee Rivers, S. C. They all agree in being perfectly uniform dark above and uncolored on the belly. The Pedee River series ranges from 40–150 mm. in length and shows no color-pattern at any stage. There can be no question of the distinctness of this form.

3. PROTEUS ANGUINUS Laurenti.

Loc.? 4,279; [4,312–4,314 (3)].— EUROPE, [873]; 4,269; 4,270.— CARNIOLA, Caves, 3,973; Adelsburg cave, 2,366.— DALMATIA, 1,905.— STYRIA: Gratz, 1,942.

Unfortunately, some of these specimens cannot be referred to any of the various local races. They are all long snouted as figured by Boulenger for *P. carrarae* and for *P. zoisii*. M. C. Z. 1,942 is uniformly pigmented above; 3,973, and 4,269 are slightly striped.

CRYPTOBRANCHIDAE.

4. CRYPTOBRANCHUS ALLEGANIENSIS (Daudin).

Loc.? 1,320 (*skeleton*); 1,845 (*skull*); 4,372 (*slough*).— N. Y.: ? Cayuga Lake, 2,009 (5); Headwaters Allegheny River, 1,281 (3).— S. C.: Charleston, 256.— MISSOURI, 134 (4).

5. MEGALOBATRACHUS MAXIMUS (Schlegel).

Loc. ? 4,721.— JAPAN: 332; [1,887 (*skeleton*)]; Nagasaki, 2,393; Tokio, 1,896 (4).— CHINA: Western Szechuan, Hung-ya-hsien, 2,849; Ya-chow, 2,853.

The two Chinese specimens are noteworthy as giving definite locality-records of this species on the mainland of Asia.

AMPHIUMIDAE.

6. AMPHIUMA MEANS Garden.

S. C., 938.— GA., 148.— FLA.: Eau Gallie, 2,768; Pensacola, 141; 150.— [ALA.: Mobile, 143].

All the above are small, nearly uniform blackish above and below, and with two fingers or toes on all the limbs.

7. AMPHIUMA TRIDACTYLUM Cuvier.

ALA.: Greensboro, 4,079.— MISS.: Natchez, 144.— LA.: 25 miles N. of New Orleans, 1,629–1,631 (3).

These are very large, dark above and light below with a distinct line of demarcation. There are three fingers or toes on all the limbs.

SALAMANDRIDAE.

We are confronted with the problem of what name to apply to that mass of species of Salamandridae, which is often called Triton Laurenti (1768), not Linné. The earliest substitute name, as Stejneger has shown, is Triturus Rafinesque 1815. If, however, we subdivide Triton Laurenti. we must ascertain the type, and to it and its allies restrict the generic name Triturus. Fitzinger indicated *T. cristatus* Laurenti as type of Triton in 1843.

This aggregate of species is usually separated on the presence or absence of a bony postfronto-squamosal arch. Nevertheless European herpetologists, while retaining the genus in its all-embracing entirety, usually recognize certain groups of vicarious species, such as the Euproctus group, the Pleurodeles group, etc.

The species of these groups which are in many instances scarcely more than local races are not marked by constancy in the supposedly important character of the postfronto-squamosal arch. When it is found that in the Euproctus group, *asper* of the Pyrenees and *rusconii* of Sardinia have the bony arch, and that *montanus* of Corsica lacks it, suspicion arises that this character *surely* has been given a fictitious value. Similarly, such closely allied animals as *vulgaris, palmatus, montandonii, boscai,* and *italicus,* which are not at all easy to distinguish out of the breeding dress, and which are, as Wolterstoff states, in large part vicarious forms, are characterized by no such uniformity in the temporal arch as we should expect if this character is of great importance. Two, *vulgaris* and *italicus,* lack it, the rest have it. It seems that no weight can be placed on a character which separates closely allied forms and throws together forms not at all closely related. All the newts seem to be developing or losing this arch more or less independently.

If we remove the Euproctus group and the Pleurodeles group the most distinct species is unquestionably Cope's *crocatus* from Persia.

This animal is in appearance far more like Salamandra than like Triturus, as it has a long rounded tail, and is marked with large yellow spots. The dentition, however, is that of Triturus. Perhaps this animal had better remain as Cope described it, the type of Neurergus. Here also may belong *Molge macrosema* Boulenger, whose habitat is unknown.

A very natural group is formed by *vulgaris, palmatus, italicus, montandonii, boscai, vittatus* of Gray, and the North American forms allied to *viridescens.* These are all similar in size, coloration, shape of head, and even agree in the possession of three longitudinal grooves on the head. I do not see how these animals can be divided into two genera. It may here be noted that in this group are two forms known as *vittatus* and two known as *meridionalis.*

This necessitates a renaming of two forms, a course as regrettable as it is necessary.

The other species, including the European *cristatus, marmoratus,* and *alpestris,* the Asiatic *wolterstoffi, sinensis, pyrrhogaster,* and *ensicaudus,* and the American *torosus* are more or less problematical in their relationships; the last, *torosus,* seems closer to the Asiatics than to the Europeans, just as *viridescens* is far closer to the Europeans of the *vulgaris* group than to *torosus.*

If the possession of a dorsal crest by the breeding males and the lack of a bony temporal arch are considered primitive characters, it is quite apparent that these two characters are practically restricted to Europe, where the Salamandridae reach their greatest development in number of forms, and which is the geometrical centre of the family's range (especially if we consider *viridescens* as derived from Europe and *torosus* from Asia).

In this case certainly one does not find the primitive forms on the periphery of the range. On the other hand, if the bony arch is regarded as primitive and the dorsal crest of the breeding male as specialized, we find the primitive forms on the periphery of the range. But if we regard the bony arch as primitive, then all the other salamanders have lost it.

There are certainly strong reasons why the presence of the postfronto-squamosal arch should be considered primitive. In the first place the idea is quite erroneous that the more larval a salamander, the more primitive it is. Early amphibians as well as the Crossopterygian ganoids from which they were almost certainly derived had a practically complete bony temporal roof. This roof was present in the Cotylosaur reptiles and persists in its most complete modern state in the sea-turtles. One constantly finds references to the skull of such an animal as Necturus as being very "low," meaning apparently primitive. Actually, of course, the skull is simple compared to higher types, but this is not by any means the same thing as primitive, for primitive amphibians had a skull far more complex than any animal now living. We seek in vain in Necturus for lachrymals, dermosupraoccipitals, tabularia, supratemporals, intertemporals, jugals, quadratojugals and others "too numerous to mention." But all these bones were possessed by the primitive amphibians. In the same way the fact that Cryptobranchus has larval gill-arches is no indication of its primitive character. It is merely a case of arrested development.

The case for the primitiveness of Necturus rests on its separate opisthotic (paroccipital) and on the character of the pubis. The case for the Cryptobranchidae is chiefly the separate prearticulars, the large size, and the fact that a fossil is known. Even the branchials, larval as they are, differ from normal larval branchials in the absence of an epibranchial.

At any rate the primitive amphibian skull is not a simple one and a temporal roof, or the remains of a temporal roof, should be a character of the most primitive living salamanders.

In opposition to this view may be placed the two characters of Necturus just alluded to, but the pelvis of Necturus is so different from that of the Mutabilia that there may be little real affinity, and the paroccipital may yet be found to occur in the development of more than one larval salamander.

A greater difficulty in the way of this view is the fact that in other characters the newt skull is not as primitive as several which lack any trace of the arch. For instance, Ranodon, with separate lachrymals and prefrontals, and Salamandra with two premaxillaries. The fact that the premaxillaries of the salamanders with the temporal arch are fused is perhaps the greatest obstacle to their being regarded as primitive, for there is no disputing the fact that to have the premaxillaries separate is more primitive than to have them fused. But separate premaxillaries are sometimes found, as in Geotriton, along with such specialized characters as the complete absence of the lachrymo-prefrontal bone.

The newt vertebrae are opisthocoelous and the carpus and tarsus are ossified, but it is probable that the cartilaginous carpus and tarsus of many of the modern salamanders is due to arrested development and there are forms known from the European Miocene which have the opisthocoelous vertebrae.

In view of the far too great emphasis that has been laid on the developmental stage reached by individual species in assigning them to a place in the system, and also of the far too common practice of regarding characters of arrested development or aquatic adaptation as primitive, it is perhaps not out of place to emphasize a somewhat different view.

8. TYLOTOTRITON VERRUCOSUS Anderson.

BRITISH SIKKIM: Darjiling, 3,569.

9. TYLOTOTRITON ANDERSONI Boulenger.

LIU KIU: Okinawa, Nago, 2,579 (2).

These are the third and fourth specimens of this species on record.

10. PLEURODELES WALTL Michahelles.

SPAIN: Albacete, 1,935 (2).

11. SALAMANDRINA TERDIGITATA (Bonnaterre).

ITALY: Genoa, 1,625 (3); 1,943 (3).

12. EUPROCTUS POIRETI (Gervais).

ALGERIA, 1,043.

13. EUPROCTUS RUSCONII Gené.

SARDINIA, 2,167 (2).

14. TRITURUS TOROSUS (Eschscholtz).

CAL., 179 (3); 243 (13); 1,205 (2); 1,206 (5); 1,825; 1,830 (2); 4,603; 4,604; Berkeley, 4,325–4,328 (72 *larvae*); Brookdale, 3,144; Navarro River, 2,354 (7); Palo Alto, 2,352 (7); 2,353 (9); 2,355 (5); 2,530 (7); San Francisco, 173; 260 (4); 3,699; San Mateo, 1,207 (16); 4,319–4,324 (6); San Quentin, 1843 (5); Sierra Madre Mountains, 3,151–3,154 (4); Stanford University, 3,145; 3,146; Ukiah, 2,349; UPPER CAL.: Cache River, 259.

15. TRITURUS ENSICAUDUS (Hallowell).

LUI KIU: Okinawa, 2,585; Okinawa, Nago, 2,593 (4).

16. TRITURUS PYRRHOGASTER (Boie).

JAPAN, 1,230 (3); 4,688; Kanagawa, 1,607 (3); 1,915 (24); Mt. Fuji, 2,587 (5); Tokio,1,865 (3).

17. TRITURUS WOLTERSTORFFI (Boulenger).

CHINA: Yunnan-fu, 2,556 (3).

18. TRITURUS MONTANDONI (Boulenger).

RUMANIA: Carpathian Mountains, Sinaia, 3,570; 3,571.

19. TRITURUS BOSCAI (Lataste).

SPAIN: Coruña, 1,997 (10); Galicia, 1,622 (5).— PORTUGAL, 1,895.

20. TRITURUS VIRIDESCENS Rafinesque.

LOC. ? 4,712–4,720 (9).— NOVA SCOTIA: Yarmouth County, 2,292.— ME.: Norway, 1,126 (2).— N. H.: Amherst, 1,131; 1,149 (10); Exeter, 1,120 (5); Jaffrey, 4,679–4,685 (7); West Campton, 1,124.— VT.: Burlington, 1,150 (89); 1,419 (3); 1,432 (8); 4,678; Windsor, 203 (5).— MASS.: Arlington, 2,308 (3); Bedford, 1,132 (4); Berlin, 1,130; Cambridge, 1,144; Chicopee, 1,118 (2); 1,142 (6); 1,143 (3); Franklin County, 2,080 (15); Gloucester, 1,385; Lancaster, 171 (2); Leyden, 1,146 (9); 4,317; 4,318; Medford, 1,123 (2); Newton, 1,911 (3); 1,912 (8 *larvae*); Pittsfield, 2,290 (8); Rowe, 172 (75); 186 (11); Salem, 1,155 (3); Sherborn, 1,137; 2,005 (2); Springfield, 1,990; 2,008 (2); 2,069 (13); 4,614–4,617 (4); 4,754 (2); Wachusett, 2,268; Ware, 1,136 (27); Williamstown, 180 (5); 1,135 (5); 1,147 (20); 1,831 (2); Worthington, 1,139 (6); 1,151 (19).— N. Y., 194 (28); Berkshire, 177; 207 (2); Brooklyn, 230; Crown Point, 1,140; 1,237 (*larva*); 4,731; 4,732; Fallsburg, 4,315; 4,316; Rome, 184 (19); Saratoga, 2,105; Sodus, 1,153 (11); Somerville, 167; 189 (2); Sullivan County, 1,141 (24); 1,145 (2).— N. J.: Plainfield, 2,303; Ridgewood, 2,411; Schooleys Mountain, 160.— PA.: Center County, 1,127 (3); Monroe County, 1,125 (5).— VA.: Fredericksburg, 2,079; Monterey, 1,121.— W. VA., 1,148 (3); White Sulphur Springs, 1,418.— OHIO: Windham, 2,000 (5). — IND.: New Albany, 2,078 (2); New Harmony, 214 (2).— ILL.: Normal, 2,055.— KY.: Cumberland Gap, 2,224 (2); Letcher County, 1,707; Mammoth Cave, 1,048 (4).— TENN.: Knoxville, 1,128.— N. C.: Glade Creek, 1,134.— S. C.: Charleston, 1,122 (3).— GA., 1,133.— FLA.: Amelia Island, 1,129; Jacksonville, 4,697.— TEX.: Dallas, 4,618–4,625 (8).— ?ARIZ., 1, 836 (2).

21. TRITURUS DORSALIS (Harlan).

N. C.: Wilmington, 1,992 (2, paratypes of *T. vittatus* (Garman).— FLA.: Jacksonville, 1,439 (9).

This form appears to coexist along the coast with *T. viridescens* and until better known may be regarded as distinct. It is unquestionably congeneric with *Triton vittatus* Gray, described from England, but recorded also from France, the Carpathians, and Syria. Both have the bony temporal arch. Therefore Garman's name *Diemyctylus viridescens vittatus* (1897) yields to that of Gray, (1835) and a new name would be necessary were it not that Harlan (Journ. Acad. nat. sci. Phila., 6, p. 101) described this animal as *Salamandra dorsalis* from South Carolina (probably Charleston).

22. TRITURUS MERIDIONALIS (Cope).

LA.: Allemia, 4,263–4,266 (4).— TEX.: Dallas, 1,152; 4,626–4,649 (29).

This also seems distinct, although both this and *T. dorsalis* are very close to *T. viridescens*. There is an excellent opportunity for good work on the relationships of these three Southern forms with each other, oecologically as well as morphologically.

23. TRITURUS HELVETICUS (Razoum).

Loc. ? 1,232 (23); 4,335–4,344 (10 larvae).— FRANCE: Paris, 1,612 (20).— SWITZERLAND, 4,710; Neuchâtel, Montagny, 4,711.— AUSTRIA: Vienna, 443.— BADEN: Freiburg, 4,329–4,332 (4).

24. TRITURUS VULGARIS (Linné).

Loc.? 1,233 (3); 4,333; 4,334.— ENGLAND, 1,227 (25); 4,674–4,677 (4); Manchester, 1,228; 4,699; 4,700.— FRANCE: Paris, 1,623 (5).— Germany, 1,226; 4,669–4,673 (5); 4,724.— SILESIA, 2,791 (3); Fulengebirge, 3,312–3,320 (9).— RUSSIA: Sukhun Kale, 1,963 (2).

25. TRITURUS VULGARIS BOULENGERI, nom. nov.

ITALY: Piedmont, 1,361 (8).

Boulenger's *meridionalis* was published in 1882, two years after Cope's *meridionalis*. If the two species are congeneric, as I believe they are, a substitute must be employed for *meridionalis* Boulenger.

26. TRITURUS ALPESTRIS (Laurenti).

Loc. ? 1,224; 4,704; 4,705.— Alps, 1,223 (3); 1,396 (4).— SWITZERLAND, 1,221; 4,706; Lake Neuchâtel, Montagny, 923; 4,707.— ITALY: Milan, 1,036.— AUSTRIA, 1,222.— SILESIA, 2,798 (10); Fulengebirge, 3,321–3,325 (5).— PRUSSIA: Berlin, 2,089.— GERMANY, 1,225 (3).

27. TRITURUS MARMORATUS (Latreille).

FRANCE, 1,229 (2); Cadillac, 2,323 (15); Gironde, 1,624 (2).— SPAIN: Coruña, 1,998 (2).

28. TRITURUS CRISTATUS (Laurenti).

Loc. ? [4,283].— EUROPE, 1,218 (6).— GREAT BRITAIN, 1,220.— ENGLAND, 1,339; Liverpool, 1,219 (8); 4,698; Northamptonshire, 1,433.— FRANCE: Paris, 1,626 (18).— GERMANY, 1,217 (2).— WURTEMBERG: Esslingen, 2,099.— BAVARIA, 2,077 (4).— SILESIA, 2,801 (4); 3,303–3,311 (9).— HUNGARY: Budapest, 1,292 (2); 1,293 (3).— RUSSIA: Sukhum Kale, 1,962.

29. TRITURUS CRISTATUS PLATYCAUDA (Rusconi).

ITALY: Milan, 1,035 (3); Piedmont, 1,360 (5).

This name of Rusconi's (1821) has many years of precedence over Strauch's *karelinii* (1870).

30. CHIOGLOSSA LUSITANICA (Bocage).

PORTUGAL: Serra da Estrella, 1,925.

31. SALAMANDRA SALAMANDRA (Linné).

EUROPE, 4,280–4,282 (3).— ENGLAND, 2,084 (2).— FRANCE, 1,212 (2).— ITALY: Milan, 1,034 (3).— GERMANY, 896; 1,215 (12); [1,703 (2)]; 2,101 (4 *larvae*); [Darmstadt, 1,213 (2)]; Herkulesbad, 2,796 (2).— WURTEMBERG, 1,214 (7).— ALGERIA: Algiers, Edough, 1,700 (2).

32. SALAMANDRA ATRA Laurenti.

EUROPE, 1,216 (6); 1,949 (3 *larvae*).— SWITZERLAND, 1,231 (3); [1,395 (3)].— SALZBURG: Hohen Göll, 1,045 (3).— SILESIA: Breslau, 2,075 (7).

AMBYSTOMIDAE.

33. SALAMANDRELLA KEYSERLINGII Dybowsky.

SIBERIA: Lake Baikal, 1,288 (2).

34. ONYCHODACTYLUS JAPONICUS (Houttuyn).

JAPAN: Hondo, Hakone Lake, 2,586 (4); 2,594 (5 *larvae*); 2,595 (9 *larvae*); Tokio, 1,864 (*larva*).

The vomerine teeth of the adults are in two arched series behind the choanae, the two arches extending forward to a line through the anterior edge of the choanae.

The Asiatic Ambystomidae fall into two groups whose vomerine dentition is rather distinct. On the one hand, those whose tooth-series extends farther back in the middle than on the sides; to this group belong Hynobius, Pachypalaminus, and Salamandrella. *Hynobius lichenatus,* however, is transitional to Onychodactylus in dentition.

The second group of those whose vomerine series does not extend farther back in the middle than on the sides includes Onychodactylus, Geomolge, Batrachyperus, Ranodon, and Ambystoma.

This backward extension of the vomerine teeth in the middle means of course a quite different shape of the vomero-palatine bone.

In Ambystoma the teeth form a nearly straight series, not widely separated in the middle. In Ranodon and Batrachyperus the series are widely interrupted, and they are very short.

In Onychodactylus and Geomolge the series form a double arch, convex forward, and not widely separated in the middle.

The tooth-row in Onychodactylus is usually described as continuous, but it is not. There are three described forms in this group.

The most recently named is *Onychodactylus russicus* Nikolsky (Ann. Mus. zool. Acad. sci. St. Petersburg, 1913, **18**, no. 2, p. 260).

Fortunately a Latin diagnosis is given with the Russian description. It states in brief: — like *japonicus* but the tail shorter than the head and body. The third digit of the foot is the longest. The fifth is slightly shorter than the third. The head-length enters the length from gular fold to anus 3–3½ times. There are fifteen costal folds. The appressed feet do not meet. The total length is given as 75 mm., the body as pallid above, varied with dark spots, beneath immaculate white.

The type-locality is "prope sinus Ussuriiensem Sibiriae."

Nikolsky's figure (Ann. Mus. zool. Acad. sci. St. Petersburg, 1896, **1**, p. 78 reproduced in Stejneger's Herpetology of Japan, p. 24) of the teeth of Onychodactylus, Salamandrella, and Geomolge, compared with Boulenger's Catalogue of Batrachia Gradientia, p. 35, makes it quite plain that Nikolsky has practically copied Boulenger's conventionalized figure, and this is an inaccurate representation of the dentition of *Onychodactylus japonicus*. The vomerine teeth of *O. japonicus* are in all respects like Nikolsky's diagram for *Geomolge fischeri*, and like Boulenger's figure of the same (Proc. Zool. soc. London, 1886, pl. 39, fig. 6). This plate, which is part of the original description, is reproduced as part of plate 5 in The herpetology of Japan. According to Stejneger, larvae, males, and breeding females of *O. japonicus* possess claws; and Thompson (Proc. Cal. acad. sci., ser. 4, **3**, p. 183–186) in his description of *Pachypalaminus boulengeri*, states that the young of Geomolge also possess stout claws.

The physiognomy of *Geomolge fischeri*, according to Boulenger, is "that of *Onychodactylus japonicus*. . . .Limbs in every respect similar to those of *Onychodactylus japonicus*, save the absence of claws; the male likewise with tibio-tarsal dilatation. . . .Anal opening subcruciform, as in *Onychodactylus*. Skin smooth; fourteen or fifteen costal grooves; paratoids and gular fold as in *Onychodactylus*. Brown above, with blackish variegations, most crowded on the sides, which also bear some whitish spots; lower surfaces brownish white." The measurements given for a male are total length 163 mm., head 12 mm., tail 93 mm. The female measured 80 mm. from snout to vent, head 14 mm., tail lacking, body 66 mm.

As the difference in dentition seems chiefly imaginary, and the possession of claws at some stage is common not only to these forms but also to others (Pachypalaminus) whose dentition is quite different, the genera cannot be maintained as distinct.

The differential characters of *O. russicus* are first of all the short tail. All long-tailed salamanders have short tails when they are young. The proportional head-length agrees with the figure of Stejneger for *O. japonicus*. The head is too long for Boulenger's measurements of *G. fischeri*; but *G. fischeri* has a longer body than *O. japonicus*.

Compare the following measurements with those given above:—
Male; total length 161 mm., tail 92 mm., head 16 mm., body 53 mm.
Female; " " 141 mm., " 72 mm., " 15 mm., " 54 mm.

Also the head in young salamanders is always proportionally longer than in the adult. The digits as given are quite similar to both *O. japonicus* and *G. fischeri*. Fourteen costal folds are given by Boulenger for *G. fischeri*.

Thus there is the well-known *Onychodactylus japonicus* from Japan; *O. fischeri* (Boulenger) based on two adults from the Ussuri district in Siberia; and a third, *O. russicus* Nikolsky, from the same region based on young specimens. Most of the differential characters which separate this third form are characters of young salamanders in general. In particular the claws which Nikolsky supposed to ally it with *O. japonicus*, are according to Thompson present in young *O. fischeri*. There is therefore a strong probability that *Onychodactylus russicus* Nikolsky is the young of *O. fischeri* (Boulenger).

35. BATRACHYPERUS SINENSIS (Sauvage).

CHINA: Szechuan, Liang-hoko, (12,000 ft.) 2,848.

36. RANODON SIBIRICUS Kessler.

RUSSIA: Kopal, 1,964.

37. RANODON OLYMPICUS Gaige.

WASHINGTON: Lake Cushman, 4,103 (paratype); Olympic Mountains, Mt. Rose, 4,272; 4,273.

38. AMBYSTOMA OPACUM (Gravenhorst).

N. H., 958.— MASS., 4,352; Arlington, 2,295; Berlin, 960; Lynn, 1,690; 1,947; 2,443; Lynn Woods, 3,700; Salem, 1,416 (*larva*); Sudbury, 2,289; Waltham, 957.— N. Y., 220.— N. J.: Paterson, 2,395.— IND.: New Albany, 2,074.— Mo.: New Madrid County, 3,143.— GA., 157.— ALA.: Maplesville, 4,551.— LA.: 25 miles N. of New Orleans, 1,633.— TEXAS, 202.

The larvae of the species of Ambystoma are much more difficult to determine than those of Eurycea (Spelerpes). However, I have identified by the use of certain undoubted specimens of larval *A. opacum*, *A. maculatum*, and *A. tigrinum*, the various larvae in the collection. The criteria used may be of interest, and in so far as they are found to be constant the records of larvae can be accepted.

A. opacum. The appressed legs scarcely meet. Stouter. Belly pigmented. Less definite demarcation between the color of back and belly. Light dots on side. Head large.

A. tigrinum. The legs scarcely meet, the belly is not pigmented. A line of light dots at demarcation between back and belly. Head large.

A. maculatum. Legs overlap, slimmer, belly not pigmented, more definite demarcation between back and belly, tail not blotched, head smaller, no stripes.

A. jeffersonianum. Legs overlap, slimmer, belly not pigmented, dark line at demarcation between back and belly, tail with black blotches above, white stripe on side above insertion of legs.

39. AMBYSTOMA MACULATUM (Shaw).

CANADA: St. Lawrence, 208.— NOVA SCOTIA, 942.— NEW ENGLAND, 1,867.— ME.: Norway, 945 (2); Upton, 948; Waterville, 2,017 (2).— N. H.: Amherst, 971; Chocorua, 2,763.— MASS., 153; 199; Amherst, 955; Auburndale, 219 (2); Berkshire County, 946; Brookline, 949; 1,991; Cambridge, 951; Lynn, [1,482]; 1,994 (5); Malden, 954 (2) Quincy, 4,345; Salem, 1,993; 2,018; Springfield, 2,070 (2); Waltham, 213 (2); Ware, 944.— N. Y.: Ithaca, 4,346–4,350 (5 *larvae*); Rome, 181 (2); Somerville, 168; 188 (2); Tupper Lake 1,238 (3 *larvae*).— N. J.: Campgaw, 4,260.— PA.: Sullivan County, 2,001 (2);— IND.: Bloomington, 2,071.— MICH.: Olivet, 4,351.— TENN.: Knoxville, 947.— S. C.: Charleston, 182.— LA.: New Orleans, 2,019; Port Hudson, 956.

40. AMBYSTOMA TIGRINUM (Green).

S. C.: Charleston, 245 (8 *adults* and *larvae*); 246 (6).— OHIO: Columbus, 963; 4,357–4,359 (3 *larvae*); Rockport, 169.— KY.: Louisville, 2,294.— IND.: Kokomo, 4,354–4,356 (3 *larvae*); New Albany, 4,686, 4,687 (2 *larvae*).— ILL.: Athens, 2,013 (2); Evanston, 414; Kendall, 2,014; Lawn Ridge, 962 (3); Peoria County, 968; Peoria, 967.— IOWA: Burlington, 152 (3); 4,540; [Davenport, 966].— MICH.: Lansing, 2,072.— [MINN.: Minneapolis, 4,543; 4,544].

With the exception of one of the specimens from Athens, Ill., the preceding are all spotted.

With the exception of a young one (2,043 from Kansas) the following are barred. This is the difference between the forms of races *A. tigrinum* and *A. mavortium.* The Californian specimens (*A. californiense*) have more yellow than most of those from east of the Rocky Mountains.

KANS., 281 (3 *larvae*); 2,043 (2).— DAKOTA, 1,738; 1,739 (2); WY.; Cheyenne 981; 2,217 (3 *adults* and *eggs*); Fort Bridger, 982; 4,528; Lake Como, 1,209 (2); 2,057; Northeastern, 1,682.— COL., 984.— UTAH: Southern, 4,353.— CAL.: Mayfield, 2,344; Palo Alto, 2,343 (5 *larvae*); 2,345; 2,356.

All of the following are axolotls. Some of the Colorado specimens show pigmentation on the belly, differing thereby from the unpigmented belly of normal *A. tigrinum* larvae. The Mexican specimens are *spotted* on the belly.

COL.: Boulder Co., 1,441 (2); Heart Lake, 11,000 ft., 4,748–4,753 (6); Pike's Peak, 280; South Park, 985 (12); 986 (20); 4,530; 4,531.— N. MEX.: Santa Fe, 1,918 (2).— MEX., 2,370; Lake Xochimilco, 2,657; Mexico, 254 (2); 1,654 (5); [1,705 (2)]; 2,357 (3); 2,623; [San Juan Teotihuacan, 2,266 (4)].

41. AMBYSTOMA JEFFERSONIANUM (Green).

N. B.: Assikeag, 2,094.— ME.: Eddington, 1,580.— N. H.: Milan, 979.— MASS.: Amherst, 977; Arlington, 2,309 (*larva*); 2,310 (*young*); Berlin, 975; Boston, 978; [Cambridge, 4,545; 4,546]; Concord, 2,886; Sherborn, 972; 2,002; Springfield, 2,096 (2); Ware, 987 (2); Waverley, 1,996 (2); Wenham, 2,093.— N. Y.: St. Lawrence County, Black Lake, 30 May, 1,860 (30 *larvae*); Somerville, 166 (3); 1,201.— MICH.: Flint, 2,092 (2); Oakland County, 1,570 (3); Olivet, 4,362; 4,363.

42. AMBYSTOMA MACRODACTYLUM Baird.

MONTANA: Powell County, Nigger Hill, 6,500 ft., 2,885.

43. AMBYSTOMA CINGULATUM Cope.

FLA.: Pensacola, 204 (2); 229 (2).

44. AMBYSTOMA MICROSTOMUM Cope.

Loc. ? 4,360; 4,361.— MO.: Jefferson County, 2,782 (2).

45. AMBYSTOMA TENEBROSUM Baird and Girard.

CAL.: Berkeley, 4,364–4,370 (7); Palo Alto, 2,547; near Palo Alto, 2,346.

PLETHODONTIDAE.

46. BATRACHOSEPS PACIFICUS (Cope).

CAL.: Santa Cruz Island, 3,169–3,194 (26).

47. BATRACHOSEPS ATTENUATUS (Eschscholtz).

CAL., 1,196 (2); 1,827 (2); 2,109 (3); [4,295–4,297 (3)]; Berkeley, 4,391–4,395 (5); Brookdale, 4,396, 4,397; Claremont, 4,523; 4,524; Filborn, Big Trees, 4,519–4,522 (4); 4,518 (4 *larvae*); Monterey, 2,102; Pacific Grove, 4,373–4,390 (18); Palo Alto, 2,358 (25); 2,548 (13); Petaluma, 1,195 (10); Sacramento, 1,198 (2); San Francisco, 156 (7); 2,282 (2); San José, 1,197 (7); 1,840; 4,605; 4,606; San Mateo, 4,398; San Mateo Creek, 1,194 (12); 2,111 (6); Santa Cruz, 3,349–3,352 (4); Santa Cruz Island, 4,690–4,696 (7).

The specimens from Claremont, although on the edge of the range of *Batrachoseps major* Camp, are in every way typical *B. attenuatus*.

48. HEMIDACTYLIUM SCUTATUM (Schlegel).

MASS.: Beverly, 2,086; Brookline, 2,639; Lynn, 1,692 (6); Medford, 1,837; Sherborn, 2,003; Springfield, 2,088 (6); Wellesley, 4,399.— N. J.: Plainfield, 2,305.— PA., 201; Cumberland Valley, 1,444.— S. C., 4,400; Charleston, 1,199.— TEXAS, 206 (3).

49. PLETHODON ESCHSCHOLTZII (Gray).

CAL., 1,822 (2); 1,999; Brookdale, 4,401–4,408 (8); Filborn, Big Trees, 4,410; 4,411; Pacific Grove, 4,409; Palo Alto, Mountains near, 2,350 (2); Petaluma, 1,208.— OREGON: McMinnville, 4,075.

50. PLETHODON GLUTINOSUS (Green).

LOC. ? [4,298; 4,299].— MASS., 1,200; [Essex, 4,300; Hamilton, 4,301–4,311 (11)].— N. Y.: Ithaca, 4,412.— N. J.: Plainfield, 2,288 (3); Schooleys Mountain, 158 (3).— W. VA., 990; Petroleum, 991.— KY., 973; Cumberland Gap, 1,397 (6); Edmonson County, 2,228.— N. C.: Catawba County, 1,382.— S. C.: Charleston, 205; 209; 1,743 (3); Seabrook Island, 993.— GA., 221 (2); 242; 4,600–4,602 (3); St. Mary's, 2,335 (2); Tallulah Falls, 4,413.— ALA.: Maplesville, 4,414–4,416 (3) Mobile, 4,745.— MO.: Jefferson County, 3,155; Osage River, 195; (5).— ARK., 178 (2).— TEXAS: Beaver Cave near San Marcos, 4,541; 4,542.

51. PLETHODON METCALFI Brimley.

N. C.: Sunburst, 3,500 ft., 2,888.

52. Plethodon dorsalis (Cope).

Ky.: Bee Spring, 2,222; 4,703; Glasgow Junction, 1,885; Mammoth Cave, 1,681 (27).

Plethodon dorsalis differs from *Plethodon cinereus* in the following characters:—

1. There is usually one less costal groove.

In *P. cinereus* the greatest possible count of costal grooves is twenty. This is obtained by counting as the first one, one immediately over the arm, and as the last, a forked one immediately in front of the leg. If, as sometimes happens, the one over the arm is missing, and the one in front of the leg is not forked, there would be eighteen grooves. Very rarely there is a more real variation, in that one of the middle grooves is lacking. In this case a count of all the grooves would give nineteen and a count omitting the end grooves as before would give seventeen. Now in *P. dorsalis*, counts exactly similar to those given above for *P. cinereus*, give nineteen as the maximum number, which would be seventeen, if, as is usually the case in this form, the one over the arm and the fork of the last groove are both missing; but only rarely does the count rise so high, for in at least half the series the maximum count gives only eighteen and in these specimens a minimum count (and this minimum count is more accurate in *P. dorsalis* than in *P. cinereus*) gives only sixteen. To sum up, if we omit one groove sometimes present over the arm (much more frequently in *P. cinereus*) and do not as a separate groove a fork of the one just in front of the leg (and this also is more frequent in *P. cinereus*), the costal grooves of *P. cinereus* are eighteen, rarely seventeen, and those of *P. dorsalis* are indifferently seventeen or sixteen.

2. The tail of *P. cinereus* is longer than that of *P. dorsalis*. In *P. dorsalis* the tail is never as long as the head and body, while in *P. cinereus* it is often longer.

3. The dorsal band or strip is in all but one of this series markedly zigzag, so that the stripe resembles that of *Desmognathus ochrophaea carolinensis*. In one of the series the stripe is straight edged, but much narrower than that of *P. cinereus* of equal size. This specimen has a head-and-body length of 40 mm. The stripe is between 1 and 2 mm. wide. In *P. cinereus* of the same size from Massachusetts the stripe is over 3 mm. wide.

Like *P. cinereus* this form has a melanistic phase. It is, however, much rarer and seems to be a gradual darkening with age rather than a true melanistic variety. Four of the thirty specimens in the collection are dark and the stripes cannot be distinguished. These are all large, in fact the four largest. The stripe is straight edged on the tail.

4. There is a light vertical line rising from the lip between the nostrils. On reaching the top of the head it forks and passes backwards along the canthus rostralis to the eye. The vertical line is never present in *P. cinereus* and the line along the canthus is very faint.

These are sufficient to show a form different from our common eastern *Plethodon cinereus*. Its status, however, is not easy to fix. Cope, in describing it from Louisville, Ky., mentions one which he found "in a bottle with common varieties of the *P. erythronotus*, the *Spelerpes bilineatus*, and *Desmognathus*, all from Essex County, Mass." These were in the Museum of the Essex Institute.

I think that this record can be disregarded for the present. In 1892 Cope recorded *Plethodon cinereus dorsalis* from Franklin, Venango Co., Pa. Possibly this was the recently described *P. wehrlei*, but it may have been *P. dorsalis*, which occurs in Ohio. He also mentions one U. S. N. M. 3,825 from Ripley, Ohio, which had sixteen costal grooves and the proportions of *P. dorsalis*. He, however, calls it *P. cinereus*, as it was melanistic. Now *P. cinereus* never has as few as sixteen costal grooves, and as *P. dorsalis* has also a dark phase, there is no reason why this specimen is not *P. dorsalis*. Cope states that in *P. dorsalis* the distance from snout to armpit is contained only three times in that from snout to groin, instead of $3\frac{1}{8}$ or $3\frac{1}{2}$, as in *P. cinereus*. As a matter of fact it is three in both.

O. P. Hay in his Batrachians and reptiles of Indiana in 1891 records *P. dorsalis* from Wyandotte Cave, near Louisville, Ky., and at Bloomington, Ind.

In 1907 McAtee, (List of the mammals, reptiles and batrachians of Monroe County, Indiana. Proc Biol. soc. Washington,) records *P. cinereus*, *P. dorsalis*, and *P. erythronotus* and states that *P. dorsalis* is rare.

He states that *P. erythronotus* is found in comparatively dry places and that the other two are found near water. This may be significant when we consider that there is a distinct possibility that McAtee's *P. cinereus* may have been the dark phase of *P. dorsalis*.

The same applies to Hahn's statement in The fauna of Mayfield's Cave. Publication 67, Carnegie inst., 1907. Mayfield's Cave is in Monroe Co., Ind. Hahn records two *P. cinereus* and one *P. dorsalis* taken in the Cave.

Hahn, in a second paper, in 1908, (Notes on the mammals and cold-blooded vertebrates of the Indiana University Farm, Mitchell, Indiana,) states that "None were noted, however, of the so-called *erythronotus* variety with the red of the back bordered by parallel lines, but the *dorsalis* variety with an irregular line of red along the back was almost as common as the ashy-colored individuals . . . these have the sides and dorsum of the tail mottled with gray and brown, caused by the segregation of the gray specks into certain areas." This does not accord with the dark phase of *P. cinereus* as it is met with in the east.

These are all the records I have been able to find of this salamander. It apparently is restricted to a region including western Pennsylvania and southwestern Ohio, southern Indiana, and central Kentucky.

True *P. cinereus* is not known from Kentucky as yet. It is found in Ohio, Indiana, Illinois, Missouri, and Arkansas, to the north and west and in eastern Tennessee to the southeast.

It apparently occurs with *P. dorsalis* in Ohio and Indiana. I think it more in accord with our knowledge of the two forms at present to regard *P. dorsalis* as a distinct species.

53. PLETHODON CINEREUS (Green).

N. B.: St. John's, 1,236; 4,661; St. John's, Lily Lake, 1,187 (23).— ME.: Rangeley, 2,106; Treat Island, 1,174 (2); 1,178 (2); Waterville, 2,104.— N. H.: Amherst, 1,189; Exeter, 1,191 (8); Milan, 1,190; 4,736; White Mountains, Glen House, 1,169.— MASS.: Bedford, 1,179; Berlin, 1,170 (3); Beverly, 4,726–4,730 (5); Boston, 1,819; Cambridge, 4,427–4,438 (12); Cape Cod, 1,181 (7); Cohasset, 3,527; Feltonville, 1,177 (2); Gloucester, 1,386; Hudson, 1,180 (2); Lynn, 1,691 (5); Malden, 1,430; Mattapan, 1,851; Medford, 1,183; Mount Tom, 1,184 (3); Newton, 1,910 (12); 2,300 (3); Sherborn, 2,004 (2); Springfield, 2,067 (19); 4,533–4,539 (7); 4,611–4,613 (3); Tuckernuck Island, 2,286; Ware, 1,172; Warwick, 1,182 (6); Westboro, 4,417–4,426 (10); West Roxbury, 1,185; 1,821 (5); Williamstown, 1,175; Windham, 2,068 (9); Woburn, 1,186.— N. Y.: Berkshire, 176; 228; 239 (2); Fallsburg, 1,176 (4); Ithaca, 3,156; 3,157 (2); 3,159–3,162 (4); 3,164–3,168 (5); 4,659; 4,660; Somerville, 164 (14); 165 (5); 187 (18); 191 (2); 1,188.— N. J.: Plainfield, 2,304 (2); Schooleys Mountain, 162 (3).— PA.: Norristown, 1,413; 1,414 (2).— VA.: Bailey's Cross-roads, 4,763, 4,764 (2); [Norfolk, 4,725]; Strasburg, 2,031 (4).— GA., 154; 241; Dallas County, 1,834 (2).— ILL.: 1,828 (4).— MICH.: Flint, 2,113 (2); Marquette County, 2,110 (2).

54. ANEIDES LUGUBRIS (Hallowell).

Loc. ? 4,287–4,289 (3).— CAL., 216; 1,842; 2,076 (4); [4,284–4,286 (3); 4,290–4,294 (5)]; Brookdale, 4,449–4,452 (4); Carmel, 2,544 (2); Pacific Grove, 4,439–4,448 (10); Palo Alto, 2,347; 2,351 (7); 2,549 (5); Petaluma, 1,204 (4); 4,689; San Francisco, 192 (5); San José, 1,046; 1,047 (5); 1,749 (2); San Mateo, 2,066; Santa Barbara, 4,453–4,460 (8).

55. ANEIDES IECANUS (Cope).

CAL.: Los Gatos, 2,545; Stevens Creek Cañon, 2,348 (2).

This species is not so large as *P. lugubris* and is uniform black.

56. DESMOGNATHUS QUADRAMACULATA (Holbrook).

N. C.: Blantyre, 2,638.— S. C.: Charleston, 183.

57. DESMOGNATHUS MONTICOLA Dunn.

W. VA.: Petroleum, 1,163.— KY.: Breathitt County, 1,708; Edmonson County, 2,230.— N. C.: Blantyre, 2,546.— GA., 200 (5); 215 (3).

The West Virginia and Kentucky records extend the known range of this form considerably. It is not surprising to find *D. monticola* in the Alleghanies in Ritchie Co., W. Va., and Breathitt Co., Ky., but the Edmonson Co., Ky., record is so surprising that one is inclined to doubt whether there may not be some error.

58. DESMOGNATHUS FUSCA FUSCA (Rafinesque).

SASKATCHEWAN: Cedar Lake, 1,572.— ME.: Norway, 1,569 (2); Rangeley, 2,082 (8).— N. H.: Amherst, 1,165; 1,167 (2); Blair, 4,583; North Conway, 1,166 (3).— VT.: Burlington, 1,160.— MASS.: Springfield, 1,990; 2,087 — [Conn.: New Haven, 4,470].— N. Y.: Berkshire, 174; 231; 1,157; 1,161 (3); 4,584–4,590 (7); Ithaca, 4,467; 4,468; Ovid, 1,158; Tupper Lake, 4,461; Utica, 4,462–4,466 (5).— N. J.: Plainfield, 2,306 (10); Ridgewood, 2,409 (2); 2410.— PA.: Center County, 1,164; Sunbury, 1,159.— VA.: Bailey's Cross Roads, 2,095 (2); Danville, 1,839 (2); Lynchburg-Otter Peaks, 1,429.— ILL.: Normal, 2,054; 2,056 (2).— KY.: 2,085 (6); 4,743; 4,744; Bee Spring, 1,466; Cumberland Gap, 2,223; 4,667; 4,668; Dismal Creek, 4,469; Edmonson County, 2,229.— TENN.: Knoxville, 222.— N. C.: Catawba County, 1,383; [Raleigh, 4,723].— GA., 155 (12); 163 (8); 4,569; 4,570.

The Cedar Lake record is a most remarkable one. It lends credence to Nash's record for Ontario. It is of course an instance of postglacial spreading, and indicates that *D. fusca* in times directly after the glaciation extended much further west. The isolation of *D. brimleyorum* in Arkansas and the fragmentary range of *D. fusca* in Indiana and Illinois led me to this belief when writing my revision of the genus, though at the time I did not expect so startling a corroboration.

59. DESMOGNATHUS FUSCA AURICULATA (Holbrook).

N. C.: Beaufort, 1,168 (9); 4,657; 4,658; New Berne, 1,884.— FLA.: Jacksonville, 1,070 (3).— ALA.: Mobile, 2,783; 4,746; 4,747.

60. DESMOGNATHUS BRIMLEYORUM Stejneger.

ARK.: Hot Springs, 2,598 (2 *paratypes*); 2,537; 2,784 (2); Little Rock, 3,142; 4,547–4,550 (4).

61. DESMOGNATHUS OCHROPHAEA OCHROPHAEA Cope.

Loc. ? 4,471–4,474 (4).— N. Y.: Berkshire, 4,591–4,593 (3); Ithaca, 3,158; 3,163; 4,525–4,527 (3).— PA.: Gold, 4,475–4,480 (6).

62. DESMOGNATHUS OCHROPHAEA CAROLINENSIS Dunn.

N. C.: Black Mountains, 1,162 (3); Blantyre, 2,631; Macon County, Bald Mountain, 2,543; Saluda, 4,481.— TENN.: Unaka Springs, 4,482.— GA., 212; 4,594–4,599 (6).

63. STEREOCHILUS MARGINATUS (Hallowell).

N. C.: Lake Ellis, 2,541; New Berne, 4,742.

New Berne is the most northerly, and I believe the third recorded locality for this rare species.

64. TYPHLOTRITON SPELAEUS Stejneger.

Mo.: Stone County, 3,141; Stone County, Marble Cave, 2,781 (2); 2,873–2,880 (8); Stone County, Reed's Spring, 3,485 (*larva*); Wright County, Davis Cave, 2,554 (2 *larvae*).

This species seems closest of all to the free-tongued species of the Plethodontidae. The tongue is a great deal freer than in any other of the attached-tongued species and the larva has only three epibranchials instead of the four found in Desmognathus. Furthermore the great resemblance of the larva to that of *Pseudotriton ruber* and the angle in the vomerine tooth-row ally it to that species although the prefrontal bone is of the usual type and does not reach the nares.

65. Typhlomolge rathbuni, Stejneger.

Tex.: San Marcos, 2,428; 4,170; 4,171; San Marcos, Frank Johnson's well, 4,653; 4,654.

The latter is a recently discovered place of capture and is worth noting as the species is no longer taken at the old well where it was first caught.

I cannot agree to the assignment of this animal to the Proteida where it is placed in the recent Check list of Stejneger and Barbour. It agrees, as Miss Emerson has shown, in practically every point in its anatomy with the larvae of Pseudotriton and of Typhlotriton. If the classification is to show the relationships I do not see how this species can possibly be placed anywhere than among the Plethodontidae as a permanent larva. In the absence of lungs, the fusion of the otic bones, the absence of any ypsiloid apparatus, even in such characters as the fusion of the premaxillaries and the number of epibranchials, it agrees with the larvae of the two genera of Plethodontidae mentioned. Indeed, every reason that can be assigned for placing Typhlomolge in the Proteida applies also to the axolotl.

66. Gyrinophilus danielsi (Blatchley).

N. C.: Haywood County, 2,890.

67. Gyrinophilus porphyriticus (Green).

Ontario, 1,370 (3).— N. H.: White Mountains, 996.— Mass.: Princeton, 2,296; Williamstown, 4,483–4,488 (6).— N. Y.: Adirondack Mountains, McBride's Pond, 3,976; Berkshire, 198 (5); 1,240; 4,577–4,582 (6); Elizabethtown, 2,279; Tupper Lake, 994; 4,274.— N. J.: Plainfield, 4,489 (*larva*).

68. Geotriton fuscus (Laurenti).

Italy: Genoa, 1,944.—Sardinia, 2,166.

Inasmuch as this species has not only separate premaxillaries, but lacks the prefrontal bones, I can see no reason why it should be included in Eurycea (Spelerpes *auct.*). It deserves generic rank more than does Gyrinophilus, which is usually accorded that rank.

69. PSEUDOTRITON MONTANUS Baird.

N. C.: Beaufort, 997.— TENN.: Knoxville, 224 (2).

At the base of the free-tongued salamanders should come those which have two premaxillaries, as Gyrinophilus and Geotriton. These two genera differ from each other in that Gyrinophilus has large prefrontals which form part of the border of the nasal opening, while Geotriton lacks these bones altogether.

Pseudotriton has the prefrontals cut off from the nasal opening, but the premaxillaries are co-ossified.

Eurycea has the prefrontals cut off from the nasal opening. Its premaxillaries are co-ossified.

Minor characters allying Pseudotriton to Gyrinophilus are seen in the habitus, the dentition, the color, and the larvae, which differ from those of Eurycea. Only one species of Eurycea, *E. lucifuga,* approaches the species of Pseudotriton in color.

70. PSEUDOTRITON RUBER RUBER (Sonnini).

N. J.: Plainfield, 2,302 (2); Ridgewood, 2,408; Schooleys Mountain, 159 (3).— PA.: Norristown, 170 (7); 1,412.— KY., 4,760–4,762 (3 *larvae*); Bee Spring, 2,220; 4,558–4,561 (4); 4,738–4,741 (4 *larvae*); Castor County, 1,243 (*larva*); Cumberland Gap, 4,664–4,666 (3 *larvae*); Edmonson County, 999; Mammoth Cave, 1,680 (6).— TENN.: Knoxville, 223.— N. C.: Catawba County, 1,381; Old Fort, 998.— GA., 193 (5); 210 (5); 217 (2); 4,532; 4,562–4,568 (7 *larvae*); Milledgeville, 185 (2).

One of the specimens from Edmonson County is very extraordinary. The tail is regenerated and hence has not a normal appearance. Otherwise the proportions are those of *P. ruber ruber.* The coloration is almost that of *P. montanus* but lacks the ground color. The palatine teeth are quite closely approximated in front, but in a small specimen this may not be of great significance.

In the larger of the two specimens from Milledgeville the vomerine teeth are not continuous with the parasphenoid series.

71. PSEUDOTRITON RUBER SCHENCKI (Brimley).

N. C.: Sunburst, 2,889.— GA.: Tallulah Falls, 4,490; 4,491.

This form of the higher southern Alleghanies intergrades with *P. ruber ruber* both to the north and to the south.

Specimens from Catawba Co., N. C., (1,381), and from Georgia, (217), show how this is effected. The chief differences between *P. ruber ruber* and *P. ruber schencki* are those of color. Briefly in the former the black spots run together in the adult and the chin is not black-white; in the latter the spots do not run together and the chin is black.

The intergrades to the east and north of Asheville, N. C., have the clear coloration but lack the black chin. The intergrades to the south have the black chin but the coloration is clouded.

72. EURYCEA LUCIFUGA Rafinesque.

IND.: White River, 4,276.— KY.: Baker's Furnace, 1,110 (6); Bee Spring, 4,557 (*larva*); Diamond Cave near Glasgow Junction, 1,465; Dismal Creek near Bee Spring, 4,496 (*larva*); Edmonson County, Haunted Cave, 1,464; 1,679 (2); Lexington, 2,271 (3 *larvae*).— MO.: Jasper County, Wilson's Cave, 2,269 (22 *larvae*); 2,270 (*larva*); 4,607, 4,608 (2 *larvae*); Jefferson County, 2,778 (2); 3,147; Stone County, 2,540; Stone County, Marble Cave, 2,550.— ALA., 225 (*larva*).

Larvae of Eurycea are distinguished from those of Pseudotriton and Gyrinophilus, which also have dark gills, by being noticeably lighter on the dorsal surface than on the sides. They fall into three groups, groups which are also evident in the relationships of the adults. These are; — 1st *E. lucifuga;* 2d *E. longicauda, guttolineata*, and *melanopleura* (*stejnegeri auct.*); 3d *E. bislineata* and *multiplicata*.

Larvae of *E. lucifuga* show a resemblance to larvae of Pseudotriton in that there is not so sharp a demarcation between the back and sides. The upper series of larval areas are not so large as in the other species and the back becomes light by gradual loss of pigment instead of an enlargement of the areas.

The lateral and lower series are not conspicuous, but the lower series is present. The most noticeable feature of *E. lucifuga* larvae is a wide grayish stripe between the lateral and lower series of larval areas.

Larvae of *E. guttolineata* are distinct, owing to the prominence of the lower series which forms a stripe along the sides of the belly, and to the almost immaculate dorsal surface of the larvae which is sharply marked off from the almost black sides. Larvae of *E. longicauda* and *E. melanopleura* show the same features but owing to their generally having less pigment the lower row of areas is not conspicuous.

Larvae of *E. bislineata* and *E. multiplicata* have the lower row of areas lacking and the upper row is very large and pigment accumulates as a broken band between the areas of each upper row so that there is a broken dorsolateral stripe. Larvae of *E. multiplicata* have a much slimmer form, owing to the greater number of costal grooves.

The following key gives a summary of the above.

1. No sharp demarcation between the lighter back and the darker sides, 13 costal grooves.
   Lower row present, gray band on sides................*lucifuga.*
2. A sharp and uninterrupted demarcation between the lighter back and the darker sides, lower row present, 13 costal grooves. Sides black.
   A. Lower row a definite stripe.................*guttolineata.*
   B. Lower row not a definite stripe
   longicauda and *melanopleura.*
3. A sharp but broken demarcation between the lighter back and the darker sides, lower row absent, more than 13 costal grooves.
   bislineata and *multiplicata.*

As far as known no two species of any one of these three groups occur together. This renders identification simpler and surer.

73. Eurycea guttolineata (Holbrook).

Loc. ? 4,494, 4,495 (2 *larvae*).— N. C.: Andrews, 2,539; Gaston County, 1,303. — Ga.: Augusta, 235.— Ala.: Mobile County, 2,777 (2); 3,150.— Miss.: Water Valley, 4,493.— La.: New Orleans, 2,100; Port Hudson, 1,109.

74. Eurycea longicauda (Green).

Va.: Hot Springs, 4,492.— W. Va.: Petroleum Lake, 1,108.— Ohio, [4,275]; Yellow Springs, 1,112 (13); 1,886.— Ky.: Bee Spring, 995 (*larva*); Cumberland Gap, 2,225 (12); Edmonson County, 1,107; 2,227 (2); Mammoth Cave, 1,111; 2,226.— Mo.: Jefferson County, 2,779 (3); 3,149; St. Louis, 2,301.— Ga., 218 (3).

The specimens from Georgia are very close to *E. guttolineata.* They differ from typical *E. longicauda:*— 1st, in having the median line of the tail unspotted, 2d, the bars on the tail are fused dorsally and 3rd, there is a single, somewhat run together, line of spots in the middle of the back instead of a generally spotted back. The physiognomy is that of *E. guttolineata.*

The only real differences between them and *E. guttolineata* are that the belly is unpigmented, the middorsal stripe is somewhat broken up, and there are distinct evidences of bars on the tail. As these specimens are without definite locality, I do not make *E. guttolineata* a subspecies, but there can be no doubt that they intergrade, and that this intergradation takes place in Georgia. It is gratifying that my prediction as to the close relationship of these two forms is demonstrated.

75. EURYCEA MELANOPLEURA (Cope).

Mo.: Jasper County, Wilson's Cave, 2,551 (paratype of *E.* (*Spelerpes stejnegeri* Eigenmann); 4,609; 4,610; Stone County, 2,538; 2,780 (2); 3,776; 3,777; Stone County, Reed's Spring, 3,486.— TEX., 244.

This species is very close to *E. longicauda,* differing from it in the indistinctness of the bars on the tail, and in the arrangement of the pigment on the back so as to leave the median line unspotted. Traces of this arrangement are sometimes found in young *E. guttolineata* where the dorsal stripe is divided in the middle.

Comparison of all available material of this species including the type, with similar material of the so-called *Spelerpes stejnegeri* Eigenmann, makes it perfectly plain that the former is the young of the latter. Cope's name has years of priority over Eigenmann's.

Hurter in various publications records this species, under Eigenmann's name, and as *E. longicauda* from different localities throughout Missouri. He records them in a way that indicates an overlapping distribution. However, as these two species are very closely related and as Hurter was collecting before *E. stejnegeri* was described, and as neither this collection, nor the National Museum, which includes Hurter's own collection, has the two from the same place or from places which would mean overlapping of ranges, it is probably safe to regard them as vicarious species. Specimens of *E. longicauda* are in collections from two counties, St. Louis and Jefferson. Franklin county is the farthest east for *E. melanopleura.*

76. EURYCEA MULTIPLICATA (Cope).

ARK.: Pulaski County, 2,883; 2,884.

77. EURYCEA BISLINEATA (Green).

CANADA: St. Lawrence, 240.— ME.: Paris Hill, 315 (7); Rangeley, 2,103 (4); 2,112 (2).— N. H.: Amherst, 1,193; North Conway, 4,733–4,735 (3); Shelburne, 1,945.— VT.: Woodstock, 4,507–4,511 (5).— MASS.: Auburndale, 1,235; Boston, 4,662; 4,663; Leominster, 211; Medford, 1,841 (4); North Wrentham, 1,829; Rowe, 175 (20 *larvae*); Waltham, 233; Watertown, 4,512–4,516 (5); Wenham, 1,202 (4).— CONN.: New Haven, 4,497–4,506 (10).— N. Y.: Berkshire, 232; 236 (2); 238; 1,114; 1,116; 1,909 (7); 4,571–4,576 (6); Ithaca, 3,148. — N. J.: Plainfield, 2,307 (9); Ridgewood, 2,407; Schooleys Mountain, 1,914 (2).— VA.: Lynchburg-Otter Peaks, 4,737.— OHIO: Yellow Springs, 1,192 (2).—IND.: Wabash, 2,552.— KY.: Bee Spring, 4,701, 4702 (2 *larvae*).— N. C.: Mitchell's Peak, 1,115; [Raleigh, 4,722].— S. C.: Charleston, 227.— GA., 234; 1,913.— FLA.: Camp Barranca, 1,375; 4,552–4,556 (5).— ALA.: Maplesville, 4,517.— LA.: New Orleans, 2,098 (2).

The ally of this species is *E. multiplicata.* The two represent a wave of dispersal which has reached New Brunswick to the northeast and New Mexico to the southwest.

78. MANCULUS QUADRIDIGITATUS (Holbrook).

N. C.: Raleigh, 4,076–4,078 (3).— FLA.: Camp Barranca, 1,378; Gulfport, 3,575.

This species is closely allied to the species of Eurycea, especially to the group of *E. guttolineata.* The larva, which resembles exceedingly the larva of that species, has the lower row of areas a stripe, but of course the four toes distinguish it at once.

79. OEDIPUS LEPROSUS (Cope).

MEXICO: Hidalgo, Guerrero, 3,912–3,930 (19).

I use Oedipus provisionally for the salamanders allied to *leprosus, bellii, variegatus,* etc. These do not seem to be particularly close to he species of Eurycea or Pseudotriton. Still less are they allied to the European *Geotriton fuscus.*

80. OEDIPUS BELLII (Gray).

MEXICO: Hidalgo, Guerrero, 3,931–3,949 (19); San Miguel, 3,956.

81. OEDIPUS ADSPERSUS Peters.

COLOMBIA: San Lorenzo, 3,894; 3,895.— VENEZUELA: Culeta near Merida, 2,605.

82. OEDIPUS VARIEGATUS (Gray).

MEX.: Southern, 2,314.

83. OEDIPUS YUCATANICUS Peters.

YUCATAN: Chichen Itza, 2,431; 2,773 (3).

84. OEDIPINA UNIFORMIS Keferstein.

COSTA RICA: Cartago, 2,821.

SIRENIDAE.

85. SIREN LACERTINA Linné.

LOC. ? [4,278 — Southeastern U. S., 4,277].— S. C.: Charleston, 1,445; 1,446; Georgetown, 140.— [GA.: Athens, 255].— ALA.: Mobile, 149.— LA.: New Orleans, 250.— ILL., 941 (3).

86. PSEUDOBRANCHUS STRIATUS (Leconte).

S. C.: 961 (7); Charleston, 2,083.— GA., 147 (6).

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ANTILLEAN ISOPTERA.

By Nathan Banks.

With Two Plates.

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No. 10.— *Antillean Isoptera.*

By Nathan Banks.

This paper is based on material in the Museum of Comparative Zoölogy, American Museum of Natural History, and that of the U. S. Bureau of Entomology and the U. S. National Museum. The principal part of the collection is that collected by Dr. W. M. Mann in Haiti; a considerable amount was taken by the late Mr. H. G. Hubbard in Jamaica; the other series are much smaller.

Not many species have been recorded from the West Indies, but in 1910 Dr. Nils Holmgren in a revision of the American Eutermes described a number, mostly based on the nasuti only; several of his species are certainly only forms of the old *Termes morio,* a species unrecognized by him; I believe I have correctly placed all of the Holmgren species.

As a whole the West Indian termite fauna is simply an extension of the South American fauna, and only slightly modified; all the genera occur in South America. The majority of the species are found in the larger islands, Cuba and Hispaniola (Haiti and San Domingo). Thirteen species, eight genera, are known from Cuba; from Hispaniola twelve species, seven genera; six species are known from Porto Rico, and eight species from Jamaica. In all, twenty-six species and eleven genera. One species, *Nasutitermes morio,* occurs practically all over the West Indies, but not the Bahamas; *Neotermes castaneus* is also widely spread, but is not known from many of the lesser Antilles. The genus Constrictotermes is practically confined to Haiti. The Antillean termites may be arranged in two families as follows:

1. Clypeus not bilobed; no fontanelle; wings not ciliate on margin; soldier never with nasute head; tibia with three apical spines; mandibles toothed..*Kalotermitidae.*
   Clypeus with median groove; fontanelle more or less distinct; wings usually ciliate on margin; soldier with but two apical tibial spines, head often nasute, mandibles often unarmed...........*Termitidae.*

KALOTERMITIDAE.

Adults.

1. Median vein faint, about one half way from radial sector to cubitus. *Kalotermes.*
   Median vein as dark as radius, and close to radial sector all the way out. *Neotermes.*
   Median vein faint, at first well separated then bending up to unite with the radial sector before tip. . . . . *Cryptotermes.*

Soldiers.

1. Head with large cavity in front; mandibles short, armed alike. *Cryptotermes.*
   Not so 2
2. Femora much thickened; third antennal joint more or less differentiated from others . . . . *Kalotermes.*
   Femora slender; third antennal joint simple as the others . . . . . *Neotermes.*

CRYPTOTERMES.

Only one species has as yet been recorded from this region.

CRYPTOTERMES BREVIS (Walker).

CUBA: (Wright; Osten Sacken); Cayamas, 16 February (Schwarz); Santiago de las Vegas (Cardin). DOMINICA: Laudet, June (A. M. N. H.) ST. THOMAS.

NEOTERMES.

Soldiers.

1. Pronotum angularly emarginate in front; head much elevated above pronotum . . . . *elevatus.*
   Pronotum roundedly emarginate in front; head but little above pronotum. *castaneus.*

NEOTERMES CASTANEUS (Burmeister).

CUBA:— Cayamas, 27 May (Schwarz); (Gundlach; Wright). HAITI:— Diquini, November (Mann). JAMAICA:—Kingston (Hubbard); Wag Water River (Hubbard); Port Antonio, 24 November, at light (A. E. Wight); Bog River, 6 April (A. E. Wight). MONTSERRAT, 23 March (Hubbard).

In some specimens the ocelli seem more oblique and the eye rather nearer to the margin of the head as in Plate 1, fig. 10.

NEOTERMES ELEVATUS, sp. nov.

Type.— A. M. N. H. *Paratype.*— M. C. Z. 10,075. DOMINICA: Laudat, June.

Soldier.— Head yellowish, browner in front; mandibles red-brown to black, rest of body pale. Head but little longer than broad; sides slightly rounded, broadly rounded behind, in the middle of front plainly depressed, above clothed with rather long, erect hairs; mandibles large, stout, sharp-pointed, almost as long as width of head, the left one with three teeth as usual, right with two teeth near middle; labrum short; clypeus moderately long, rounded at tip; antennae 12-jointed, third joint not modified nor longer than second; gula hardly one half as wide in middle as in front. Pronotum twice as broad as long, angularly emarginate in front, sides rounded into the hind border, above with many fairly long bristles; cerci distinct; legs short, femora slender, hind femur about four times as long as broad. The head is so attached as to be much above the level of the thorax. Length of head, exclusive of mandibles, 2 mm.; width 1.5 mm.

KALOTERMES.

Winged.

1.	Head and thorax red-brown, small species not 10 mm. long	*posticus.*
	Head and thorax pale yellowish; larger species	2
2.	Body with bristly hair	*schwarzi.*
	Body with only very short fine hair	*jouteli.*

Soldiers.

1.	Third antennal joint scarcely if at all longer than second	2
	Third antennal joint plainly longer than the second	3
2.	Eyes visible, black	*mona.*
	Eyes not noticeable, hyaline	*schwarzi.*
3.	Eyes visible, black, gula very broad	*jouteli.*
	Eyes not noticeable, hyaline, gula very slender	*posticus.*

KALOTERMES JOUTELI Banks.

CUBA:— 14 kilometers north of Vinales, 16–22 September (A. M. N. H.). BAHAMAS:— Andros, Big Wood Key, 16 May (A. M. N. H.).

KALOTERMES MONA, sp. nov.

Type.— A. M. N. H. *Paratype.*— M. C. Z. 10,076. MONA ISLAND, 21 February.

Soldier.— Very close to *K. schwarzi*, colored the same; antennae with the third joint about as long as next two together, only a little shorter than in *K. schwarzi*, and the gula narrow as in that species, the hind femora also greatly swollen. It differs from *K. schwarzi* in having a proportionally broader head, in that the eyes are black and distinct, and in having a broader pronotum, the latter more than twice as broad as long, less deeply emarginate, and the lateral parts of front margin not as much rounded as in *K. schwarzi*. From *K. jouteli* it differs in the narrow gula, and longer third joint of antennae. Length of head (exclusive of mandibles) 9 mm.

KALOTERMES SCHWARZI Banks.

CUBA, (Poey coll.). JAMAICA:— Bog River, 25 February to 29 April, at night (A. E. Wight).

Common in the southern parts of Florida.

KALOTERMES POSTICUS (Hagen).

JAMAICA: Botanical Station, Cinchona, 24 February, under bark of dead pine (Grossbeck, A. M. N. H.).

Soldier.— Head yellowish; mandibles red-brown, tips black, pronotum faintly brownish, body rather a dull yellowish, legs and antennae pale. Head about twice as long as broad, sides parallel, scarcely convex, broadly rounded behind, in front rather suddenly declivous, clypeus subquadrate; mandibles not as long as width of head, stout, toothed about as usual; antennae short, hardly longer than width of head, third joint not modified; eyes not noticeable; pronotum more than twice as broad as long, concave in front, slightly convex behind, sides rounded, hardly narrowed behind; head and body with scattered moderately long, erect hairs; legs short, hind femora much swollen. Length of head, 3 mm.

This may not be the soldier of *K. posticus;* if not it is new, and the soldier of *K. posticus* still unknown. Winged forms are from St. Thomas (Moritz), Cuba (Poey), and Haiti (Uhler).

Termitidae.

Winged.

1. Head with a small nose-like process over clypeus. . . . . *Rhinotermes*
Head without such process. . . . . 2.
2. Wings without marginal cilia; no apparent median vein. . . *Prorhinotermes.*
Wings ciliate on outer and hind margins; median vein present. 3
3. No ocelli. . . . . *Leucotermes.*
Ocelli present. 4
4. Third antennal joint plainly longer than the second; fontanelle slender, elongate or faintly triangular. . . . . *Constrictotermes.*
Third antennal joint barely if any longer than the second. 5
5. Clypeus three or four times as broad as long. 6
Clypeus twice as broad as long; above deeply indenting the lower margin of the face. 8
6. Fontanelle elongate triangular; some muscular impressions below fontanelle; pronotum usually much narrowed behind. . . . *Nasutitermes.*
Fontanelle not elongate triangular. 7
7. Fontanelle distinct. . . . . *Coptotermes.*
Fontanelle indistinct or absent. . . . . *Eutermes.*
8. Mandibles longer than usual; fontanelle indistinct or absent. *Anoplotermes.*
Mandibles of normal length, or short; fontanelle small but distinct. . . . 9
9. Cubital vein ends near tip of wing. . . . . *Mirotermes.*
Cubital vein ends much before tip on hind margin. 10
10. Pronotum twice as broad as long. . . . . *Amitermes.*
Pronotum not twice as broad as long. *Armitermes.*

The last two genera are not yet recorded from the West Indies, but occur in Panama.

Soldiers.

1. No soldier caste. . . . . *Anoplotermes.*
Soldiers present. 2
2. Head nasute, mandibles not visible above. 3
Head not nasute; or at least mandibles distinct. 6
3. Nasute process forked at tip. . . . . *Rhinotermes.*
Nasute process not forked. 4

4. Mandibles long and distinct .... *Armitermes.*
Mandibles very small, hardly noticeable 5
5. Head more or less constricted below the middle .... *Constrictotermes.*
Head not constricted .... *Nasutitermes.*
6. Mandibles toothed 7
Mandibles not toothed 9
7. Mandibles toothed unlike .... *Rhinotermes.*
Mandibles toothed alike 8
8. Head more or less nasute .... *Armitermes.*
Head not nasute .... *Amitermes.*
9. Head broader behind than in front 10
Head not broader behind 11
10. Fontanelle large, close to clypeus .... *Coptotermes.*
Fontanelle remote from clypeus .... *Prorhinotermes.*
11. Mandibles down-curved, labrum bifid .... *Mirotermes.*
Mandibles not down-curved; labrum entire 12
12. Pronotum broadest on front margin, subrectangular .... *Leucotermes.*
Pronotum broadest near middle, diamond shaped .... *Eutermes.*

PRORHINOTERMES SIMPLEX (Hagen).

Described from CUBA (Vienna Mus.); one specimen in Hagen collection, CUBA (Poey). In the U. S. N. M., there are specimens from Santiago de Las Vegas, CUBA (P. Cardin coll.), Kingston, JAMAICA (Ritchie coll.); also occurs in Florida.

RHINOTERMES MARGINALIS (Linné).

Soldier — large form.— Head bright yellowish, mandibles red-brown; abdomen and legs pale yellowish. Antennae longer than head, 17-jointed, third joint longer than second. Head plainly longer than broad behind, narrowed to the front, sides convex, labrum elongate, rounded on tip, mandibles stout, bent before middle and on inner side toward base with very large, stout tooth. Head with a few short, erect bristles, gula narrowed in middle, a little wider behind, almost twice as wide in front; pronotum narrower than head, corners bent back a little, sides much sloping to the slightly emarginate hind border; legs espec ally tibia very slender; each segment with row of erect bristles.

Soldier — nasute form.— Head broader in front part, tapering behind, with a long slender snout, slightly widened near tip; each side on the head are four bristles; antennae longer than head, 16-jointed, third joint longer than second; pronotum convex on front margin, corners nearly angulate, sides rounded into the hind margin; legs very long and slender; abdomen bristly, as in the large soldier.

HAITI:— Grande Riviere; January; Milot, January (Mann); Sanchez, 21 May (A. M. N. H.).

ANOPLOTERMES SCHWARZI, sp. nov.

Type.— U. S. N. M. CUBA:— Cayamas, 19 May (Schwarz).

Winged.— Similar to *A. fumosus* Hagen, but head and especially the pronotum broader, and the ocelli are a little farther from the eyes than in that species. The pronotum is about as broad as the head between the eyes, the front margin nearly straight, sides rounded evenly into the rounded hind border. The median vein of wing has a rather long apical fork, the cubitus ten branched; behind the radial sector toward the tip are faint traces of cross-veins running nearly one half way to median vein.

LEUCOTERMES TENUIS (Hagen).

BAHAMAS:— common at various places. CUBA:— Cayamas, 6 May (Schwarz). HAITI:— Manneville, January (Mann). PORTO RICO:— Aibonito, 25 July (A. M. N. H.). JAMAICA, (Hubbard).

MIROTERMES HISPANIOLAE, sp. nov.

Type.— M. C. Z. 10,077. HAITI:— Diquini, November (W. M. Mann). *Paratype.*— CUBA: 9 kilometers south of Pinar del Rio, September 12–23 (A. M. N. H.). The adult is known to me from Panama.

Soldier.— Head yellowish, blackish around front margin, mandibles black, antennae pale yellow; body and legs still paler. Head about one and two thirds times as long as broad, sides parallel, broadly rounded behind, truncate in front, with a median triangular process in front part reaching to front margin, clothed with scattered fine, short, erect hairs. Antennae 14-jointed, much longer than head; labrum hyaline, longer than broad, apical corners prolonged in a bristle; mandibles about as long as head, slender, down-curved, the left one rather thicker near tip, the right with a more slender point; gula about twice as wide behind as in middle, indeed a little more in front than behind. Length of head 1.9 mm.

Differs from *N. riograndensis* Müller (type before me) in smaller process, on front of head; the head is narrower than in *N. fur* Silvestri.

EUTERMES DEBILIS Heer.

This species was described from specimens in gum-copal, and Hagen identified it with specimens from PORTO RICO. I have designated it as the type of the genus.[1] It is a Microcerotermes and thus Eutermes will replace that name. The species is closely related to *M. struncki* from South America (types of which are before me). It occurs more commonly in Panama, and in a paper on Panama termites I describe the soldier and adult. Doubtless *Eutermes theobromae* Desneux, from ST. THOMAS, is the same species.

NASUTITERMES.

Soldiers.

1. Head with about ten or fewer hairs..............................2
Head with many more hairs..............................5
2. Head with ten hairs, two each side near vertex; color of head pale. *intermedius.*
Head with six or less hairs, one each side near vertex; color darker......3
3. Four distinct hairs above base of nose, nose much shorter than head....4
Hairs above base of nose very small, nose nearly as long as head which is pale..............................*hubbardi.*
4. Head a little longer than broad, smaller, abdomen more or less brown above..............................*morio.*
Head about as broad as long, larger, abdomen yellowish above..*sanchezi.*
5. Head pale yellowish..............................*ripperti.*
Head brownish..............................6
6. Head blackish brown, not hairy on the posterior sides.........*pilifrons.*
Head reddish brown, hairy all over, even on posterior sides, shorter nose. *creolina.*

Winged.

1. Wings blackish; thorax blackish; ocelli more than diameter from the eye. *morio* and *sanchezi.*
Wings and prothorax more yellowish; ocelli less than diameter from the eye..............................2

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[1] Several authors have previously selected a type-species for Eutermes; but in each case it has been a species not originally included in the genus. I have therefore selected the species most fully described by Heer, and the one species not fossil.

2. Eyes smaller; seen from side plainly much more than diameter from vertex; smaller species . . . . *creolina.*
   Eyes larger; seen from side hardly diameter from the vertex 3
3. Pronotum obliquely narrowed on sides; more than twice as broad in front as long; antennae pale yellowish . . . . *ripperti* and *pilifrons.*
   Pronotum rounded on sides, and not so much narrowed behind; not twice as broad in front as long; antennae more brownish . . . . *lividus.*

The winged specimens of several species are extremely close, and I shall not try to tabulate these; in the case of *N. morio* and *N. sanchezi*, it may be that they are all one species.

NASUTITERMES PILIFRONS Holmgren.

The adult taken with the hairy, dark-headed nasuti of Jamaica is practically identical with *N. ripperti*, and if the soldiers did not differ in color I should consider them the same species. The eyes are more circular, the ocelli usually more circular and a trifle smaller, and the vertex is more apt to be shining, the wings are rather more yellowish, and fewer long hairs on the head. The soldier described by Holmgren is very close to *N. cubanus*, except in color.

JAMAICA:— Hubbard took queens with soldiers in nest 3 at Dromilly, in April. Also at Constant Springs, 5 April; Port Maria, April, and Kingston (Maxon, U. S. N. M.) Port Antonio, and Hope Gardens, 22 February (Grossbeck, A. M. N. H.); Balaclava, 20 April, at night (A. E. Wight). It makes nests in trees.

Described from Curaçao, West Indies, and also known from Panama; probably does not occur in the same islands as *N. ripperti.*

NASUTITERMES RIPPERTI (Rambur).

The pale area between median and cubital vein is distinct near base, but beyond is faint or absent. The pronotum is pale yellow, in strong contrast to the reddish brown head. The eyes are plainly elliptic, longer in a diameter toward the upper part of face, the large ocelli close to the eyes, slightly elongate, and about one and one half to one and one third diameter from the front margin of head. The head is clothed with fine, appressed, whitish hair, and a few scattered, longer, erect hairs.

The soldier is described by Holmgren as *E. cubanus* and *E. baha-*

mensis; the minute differences given break down in a large series; adults have been taken with soldiers in both islands, so that there can be no doubt that it is Rambur's species, moreover it appears that Hagen's specimens were compared with Rambur's type.

BAHAMAS:— New Providence Nassau, and Dry Key, 13 May; Andros Isl., Mangrove Key; Nicholl's Town, 14 May (A. M. N. H.). CUBA.— Cayamas, 13 May (Schwarz); Cerro Cabras, 11 Sept. (A. M. N. H.); St. Trinidad; and no exact locality (Osten Sacken).

NASUTITERMES LIVIDUS (Burmeister).

Smaller throughout than *N. ripperti*, the color about the same except that the pronotum is not or but little paler than the head; the head not as dark as in *N. ripperti*, the ocelli are, in proportion, much larger, near to the eyes, oblique and elongate, scarcely their length from the front margin of the head, the tip of the labrum is rounded, the pronotum is proportionally narrower across the front than in *N. ripperti*; wing-scales short, the wing-membrane not noticeably hairy; the head is more densely long-haired all over than in *N. ripperti*.

The soldier is still unknown.

A type in the Hagen collection from Port au Prince, HAITI, from the Berlin Mus. (Ehrenberg), and many from Jérémie, HAITI (Weinland). CUBA:— Cayamas, 12–18 May (Schwarz).

NASUTITERMES CREOLINA, sp. nov.

Type.— M. C. Z. 10,078. *Paratype.*— A. M. N. H., ST. THOMAS, (Hagen coll.). TRINIDAD (Beebe coll.). PORTO RICO. VIEQUES, 27 July (Craft; U. S. N. M.).

Soldier.— Head red-brown, or a little darker, rest pale yellowish, sometimes with traces of brown, front margin of pronotum brown. Head nearly circular, except for the nose which is short, hardly as long as one half the diameter of the head, densely hairy all over above and on the posterior sides, and down on the nose; most of the hairs rather short. Antennae moderately long, third joint plainly much longer than the second; fourth shorter than the third, but longer than the second; body and legs densely hairy. Length of head 1.8 mm.

Differs from *N. pilifrons* in paler head, shorter nose, and hairy posterior sides of head. It is probably what Holmgren records from St. Thomas as *E. acajutlae*, if he had nasuti from there; however, his adult from Central America is different, and different from what I consider the adult of *N. creolina*. The adult *E. acajutlae* of Holmgren from San Salvador is extremely close to and probably identical with the *E. ripperti*.

The winged termite which I consider the adult of *N. creolina* is from Montserrat (Hubbard).

Winged.— Head brownish to dark brown; pronotum pale, rather yellowish, rest of body yellowish beneath, brownish above, legs and antennae pale. Wings brownish yellow as in *N. lividus* and *N. ripperti*. Head hairy; eyes rather small, less than diameter from vertex, ocelli nearly circular, less than their diameter from the eyes, fully two diameters from lower margin of head; antennae with second, third, and fourth joints all short and subequal. Pronotum shaped similar to *N. lividus* not twice as broad in front as long, the sides not much narrowed behind, and rounded into hind border. Length to tip of wings 12 to 13 mm.

Nearest to *N. lividus*, but pronotum paler and ocelli more circular and further from the front margin of head, and smaller than in that species, and differs from all allied forms in the vertex extending much higher above the eyes.

NASUTITERMES INTERMEDIUS, sp. nov.

Type.— M. C. Z. 10,079. TRINIDAD: Arepo Savanna, Cumuto, under Sphagnum (Roland Thaxter).

Soldier.— Head pale, brownish yellow, nose a trifle darker, pronotum and antennae yellowish; abdomen and legs hardly yellowish, nearly hyaline. Head a trifle longer than broad, with a fairly long nose, in front with about ten erect, rather long hairs, two each side toward vertex, four in a row near base of nose and one each side lower down; hair on abdomen extremely short, hardly noticeable, but longer bristles on hind margins; antennae of moderate length, third plainly longer than second, but not twice as long, fourth hardly as long as second, others slightly longer. Length of head 1.35 mm.

Worker.— Has the usual large dark spots on upper head each side, not as dark as in *N. morio*, and each spot shows trace of faint oblique line from the vertex downward; head with many minute hairs.

NASUTITERMES HUBBARDI, sp. nov.

Type.— M. C. Z. 10,080. JAMAICA, (Hubbard). CUBA: — Caboda (Mann).

Soldier.— Head pale brownish yellow, nose hardly darker, pronotum rather brown on front edge, rest and abdomen above yellowish; antennae also yellowish; legs pale. Head broad, and plainly a little flattened across vertex, seen from in front; nose large and very long, in side view about as long as head; two long bristles near vertex, extremely small ones below at base of nose, hardly noticeable; elsewhere on head are extremely minute hairs, scarcely visible; pronotum with only short hairs on margin; abdomen with short hair, and longer erect bristles on hind margin of segments; antennae long, third joint plainly longer than the second, fourth and fifth joints shorter than third, about equal to second, others beyond rather longer. Length of head 1.7 mm.

Lives in a small nest on ground. Near to *N. surinamensis* Holmgren, but no long hairs at base of nose nor on margin of pronotum, and vertex not as convex, and color paler than in that species.

NASUTITERMES MORIO (Latreille).

This species is common over the entire West Indian area, and a form almost the same (*N. cornigera* Motschulsky) occurs in Panama. Holmgren has described the adult as *E. costalis*; but all specimens do not show the pale area in the wing; the soldier is described by Holmgren as *E. hatienensis;* his *E. martiniquensis* is also the same, and also *E. sanctae-luciae*. Adults and soldiers have been taken in the same nest in various cases.

As might be expected, a common and widely spread species shows some variation. The distance of the ocelli from the eyes varies somewhat, and in the soldier the length of the nose, and the comparative length of the third joint of the antennae also varies; however, after examining thousands of specimens I can find no definite characters to separate races or subspecies and am much inclined to include under this species the *N. sanchezi* of Holmgren.

CUBA:— (Wright) Bolondron, February (Wheeler); Cayamas (Schwarz). HAITI:— Grand Anse (Uhler); Cap Haitien, January; Milot, January; Ennery, January (Mann); MARTINIQUE, (Hagen collection). DOMINICA:— Roseau, 12 March (Hubbard); Fore Hunt Flat, 27 June; Laudat; Portsmouth, June (A. M. N. H.). MONTSERRAT, March (Hubbard). PORTO RICO: — Aibonito, 1–3 June; Cayey, 30 May; Coamo Springs, 5–7 June; Adjuntas 1–3 June; Arecibo, 13 July (A. M. N. H.). ST. CROIX, 4 June (A. M. N. H.). MARTINIQUE:— Fort de France, 27 June (A. M. N. H.). ANTIGUA: St. John's, 5 June (A. M. N. H.); 12 February (U. S. N. M.). TRINIDAD, August Busck, (U. S. N. M.).

NASUTITERMES SANCHEZI Holmgren.

This is practically identical as regards adults with *N. morio;* and the soldiers are closely related. As a rule the adult is not as black-winged; the ocelli are larger, slightly nearer to the eyes, but there is variation in each form in this regard.

Many specimens of this form have been examined as follows:—

HAITI:— (Uhler); Diquini, November; Petionville, November; Port au Prince, December; Manneville, December, (Mann); Sanchez River, 22–27 May (Amer. Mus.). SAN DOMINGO, (Busck). PORTO RICO:— (Moritz coll.); Rio Piedras (Barrett, U. S. N. M.). JAMAICA:— Dromilly (Hubbard coll.) queens taken from nests nos. 1 and 2, nests on ground; also Castleton, and Constant Springs, both in early April (Hubbard coll.). The latter lots have adults, typical *N. sanchezi,* but soldiers approach *N. morio* in having longer nose and more narrow head than typical *N. sanchezi.* Port Antonio (A. M. N. H.); Balaclava, 24 April, at night (A. E. Wight).

CONSTRICTOTERMES.

Soldiers.

1. Third antennal joint plainly longer than the second; antennae brown..2
Third antennal joint not longer than the second....................4
2. Head but slightly constricted, yellow-brown.................*discolor.*
Head plainly constricted...3
3. Head dark brown.......................................*antillarum.*
Head pale yellow......................................*pallidiceps.*
4. Head and antennae brown, femora brownish...............*toussainti.*
Head, antennae, and legs pale yellowish.....................*flaveolus.*

CONSTRICTOTERMES ANTILLARUM Holmgren.

Described from HAITI; Dr. Mann collected it at Diquini in November.

CONSTRICTOTERMES PALLIDICEPS, sp. nov.

Type.— M. C. Z. 10,081. HAITI:— Port au Prince (Mann). Also taken by Dr. Mann at Diquini; St. Marc; Manneville.

Soldier.— Head clear, pale yellowish, nose darker, reddish; antennae brownish as in *C. antillarum,* dorsum of abdomen dull brownish yellow, legs pale, femora scarcely darker. Head plainly constricted as in *C. antillarum*, sparingly clothed with short hairs, and among them a few longer ones, nose slender, as long as width of head at constriction, hairy at tip; antennae long, third joint plainly longer than second, fourth, fifth, and sixth, and beyond as long as third, more than twice as long as broad. Abdomen with short hairs, and longer bristles on margin of segments. Length of head 1.2 to 1.3 mm.

Closely related to *C. antillarum*, but the very pale head distinguishes it; in numerous specimens of both forms I have seen no intermediates.

CONSTRICTOTERMES TOUSSAINTI, sp. nov.

Type.— M. C. Z. 10,082. HAITI:— Milot, January (Mann).

Soldier.— Head brown, not especially dark, nose black; antennae brown, as dark as head; abdomen brown above; femora and tibiae more or less infuscated, especially the front femora. Head constricted, but not as much as in *C. antillarum*, clothed with fairly numerous short hairs; antennae short, second joint fully one half of the first, third no longer than second, fourth plainly longer than the third, joints beyond are short, hardly twice as long as broad, much shorter than in *C. antillarum;* abdomen with short hair, few longer bristles on tips of segments; nose hardly as long as width of head at constriction. Head 1.3 mm. long.

CONSTRICTOTERMES FLAVEOLUS, sp. nov.

Type.— M. C. Z. 10,083. HAITI:— Petionville, November; (also taken by Dr. Mann at St. Marc, January, Ennery, January, and Manneville, December (Mann).

Soldier.— Head pale yellowish, nose darker, more reddish; abdomen yellowish above; legs and antennae whitish. Head only a trifle constricted, but by careful observation from in front it is seen to be slightly so; clothed above all over with fine, short hair; antennae short, the third joint no longer than the second, fourth and fifth no longer, sixth and beyond rather longer, but not twice as long as broad. Nose slender, about as long as width of head at constriction, fine hair also on the nose. Abdomen with short hair. Length of head 1 mm.

Differs at once from *N. ripperti* (*cubanus*) in the very much smaller head with much shorter and more numerous hairs, in hairy nose, and horter third joint of antennae.

CONSTRICTOTERMES DISCOLOR, sp. nov.

Type.— A. M. N. H. *Paratype.*— M. C. Z., 10,084. Porto Rico: — Adjuntas, 8–12 June; Manati, 27–29 June. CULEBRA Island, 5 March (A. M. N. H.). Also from El Yunque, Porto Rico, February (Stejneger, U. S. N. M.).

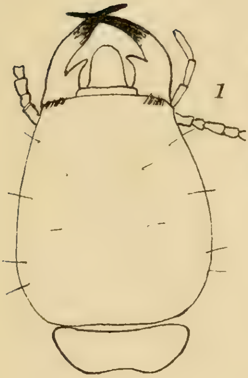
Soldier.— Head pale yellowish brown, the nose rather more brown than rest of the body, antennae brown, pronotum brownish in front, dorsum of abdomen rather dark brown, venter and legs pale. Head pyriform, vertex not as much rounded as usual, below the middle it is faintly constricted, nose long and slender, all parts finely hairy, the hairs mostly very short, but a few longer ones; antennae slender, third joint but little longer than the second; legs and body finely haired. Length 3.2 mm.; head 1.4 mm.

By slight constriction of the head it is related to *C. toussainti* and *C. flaveolus*, but the nose is much longer and more slender than in either; the head is much paler than in *C. toussainti* and darker than in *C. flaveolus;* the head is more finely haired than in *C. toussainti*, and the antennae much longer than in *C. flaveolus;* the constriction of the head is less than in either of these species.

PLATE 1.

PLATE 1.

Fig. 1. Rhinotermes marginalis, head large soldier.
Fig. 2. Mirotermes hispaniolae, head of soldier, top.
Fig. 3. Mirotermes hispaniolae, head of soldier, side.
Fig. 4. Anoplotermes schwarzi, pronotum.
Fig. 5. Rhinotermes marginalis, head small soldier.
Fig. 6. Kalotermes mona, head, soldier.
Fig. 7. Neotermes elevatus, left jaw, and hind femur.
Fig. 8. Kalotermes posticus, head of soldier, above.
Fig. 9. Nasutitermes creolina, head of adult.
Fig. 10. Neotermes castaneus, eye and ocellus of two forms.
Fig. 11. Neotermes elevatus, head of soldier, side.
Fig. 12. Kalotermes posticus, head of soldier, side.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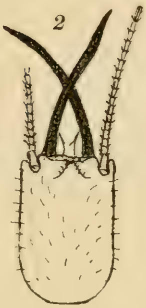
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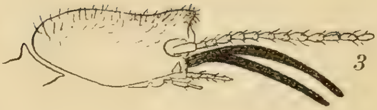
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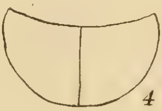
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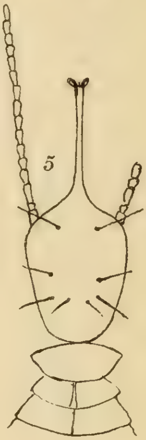
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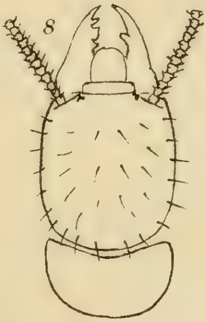
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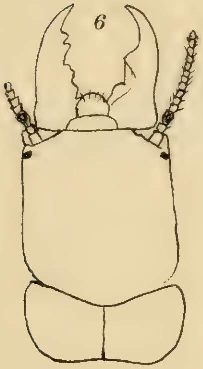
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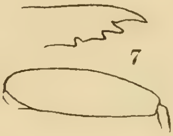
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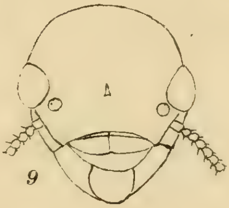
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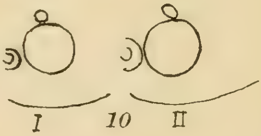
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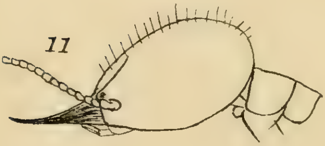
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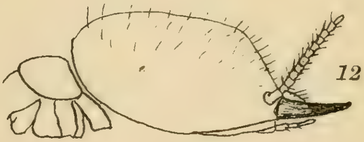
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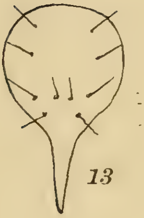
PLATE 2.

PLATE 2.

Fig. 13. Nasutitermes intermedius, head of soldier, front.
Fig. 14. Constrictotermes pallidiceps, head of soldier, front.
Fig. 15. Nasutitermes ripperti, head of soldier, front.
Fig. 16. Constrictotermes flaveolus, head of soldier, front.
Fig. 17. Nasutitermes creolina, head of soldier, front.
Fig. 18. Nasutitermes hubbardi, head of soldier, front.
Fig. 19. Constrictotermes toussainti, head of soldier, front.
Fig. 20. Constrictotermes discolor, head of soldier, front.
Fig. 21. Nasutitermes hubbardi, head of soldier, side.
Fig. 22. Constrictotermes pallidiceps, head of soldier, side.
Fig. 23. Prorhinotermes simplex, head of soldier, above.
Fig. 24. Constrictotermes toussainti, head of soldier, side.
Fig. 25. Nasutitermes intermedius, head of soldier, side.
Fig. 26. Constrictotermes flaveolus, head of soldier, side.
Fig. 27. Constrictotermes discolor, head of soldier, side.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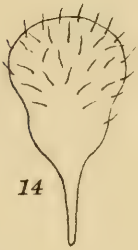
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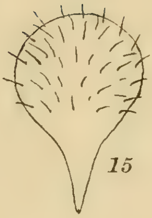
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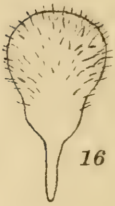
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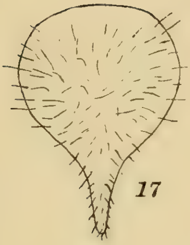
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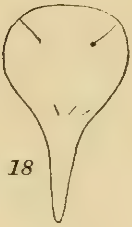
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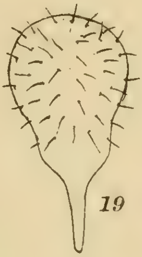
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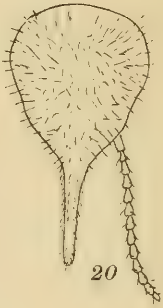
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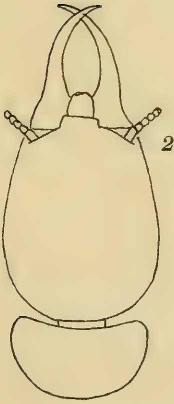
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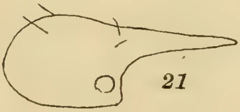
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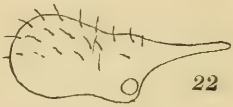
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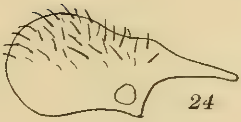
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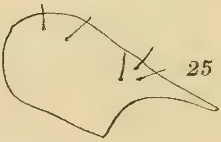
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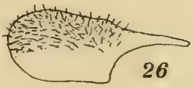
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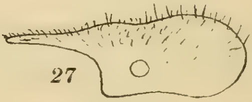
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Vol. LXII. No. 11.

THE RACES OF DENDROICA VITELLINA CORY.

By Outram Bangs.

CAMBRIDGE, MASS., U. S. A.
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January, 1919.

No. 11.— *The Races of Dendroica vitellina Cory.*

By Outram Bangs.

In October, 1886, C. B. Cory described *Dendroica vitellina* from Grand Cayman Island and in 1904 Nicoll (Bull. B. O. C., **14**, p. 95) named as *D. crawfordi* the form from Little Cayman and later (Ibis, ser. 8, **4**, p. 587) noted the same from Cayman Brac. On Swan Island, as might be expected, a different subspecies occurs which is here described.

These three sedentary island forms are closely related to the migratory Prairie Wood Warbler — *Dendroica discolor* (Vieillot) of North America, from which they differ in being larger with a longer bill, in lacking the chestnut spotting on the back, in *all* the under tail-coverts being bright yellow, and in having the sides of the breast streaked with dusky olive instead of black (in *D. v. vitellina*) or almost unstreaked (in *D. v. crawfordi* and *D. v. nelsoni*).

The three races differ as follows:—

Dendroica vitellina vitellina Cory.

Dendroica vitellina Cory, Auk, 1886, **3**, 497, 501. Grand Cayman Island.

Characters.— Sides of breast conspicuously streaked with dusky olive; sides of the face, a narrow malar stripe and markings in front and behind the eye, strongly marked with dusky olive, sharply contrasting with the yellow ear-coverts and superciliary; double wing-bands, strongly marked, yellow, the upper lemon, the lower citron-yellow; white areas of two outer tail feathers, sharply contrasted against dusky portions of the feathers; upper parts warbler-green; lower parts lemon-yellow to pale lemon-chrome. The sexes are practically alike in color in all three races.

Measurements.— Adult ♂, wing, 56 (55–57); tail, 48 (47–50); tarsus, 17.5 (17–18); exposed culmen, 10.83 (10.5–11). Adult ♀, wing, 54.5 (53–56); tail, 47.5 (45–50); tarsus, 17.5 (17–18); exposed culmen, 10.5 (10–11).

Remarks.— *Dendroica vitellina vitellina* is confined to Grand Cayman

Island.[1] It is represented in the M. C. Z. by ten adult specimens in fresh spring plumage all collected by W. W. Brown Jr.

DENDROICA VITELLINA NELSONI, subsp. nov.

Type.— M. C. Z. 58,207. Adult ♀. Swan Island (Caribbean Sea), 12 March, 1912. George Nelson.

Characters.— Sides of breast almost unstreaked or with but faint dusky olive stripes; darker markings on sides of face much paler and more indistinct and not sharply contrasted with the yellow ear-coverts and superciliary; wing-bands duller, the upper usually olive-yellow, the lower ecru-olive; white areas of two outer tail-feathers less well defined and not sharply contrasted with the dusky portions of the feathers, which are duller; colors of upper and under parts similar to those of *D. v. vitellina.*

Measurements.— Adult ♂, wing, 57.9 (56–60); tail, 50.8 (49–52); tarsus, 18.7, (18–19.5); exposed culmen, 10.7 (10–11). Adult ♀, wing, 55.3 (53–58); tail, 48.9 (46.5–51); tarsus, 18.2 (17.5–19); exposed culmen, 10.6 (10–11).

Remarks.— The series of this form consists of thirty-seven skins, which includes adults in spring, in autumn, and in worn mid-summer plumage and young of various ages. One skin was made by C. H. Townsend on his visit to the island in 1887, the others were all collected by George Nelson of the M. C. Z. on several visits made at different times of year. Mr. Nelson also took the nest and eggs. I take great pleasure in naming the form after him.

Swan Island lies approximately a little over two hundred miles southwest of Grand Cayman, and Little Cayman and Cayman Brac are about seventy miles east and north of Grand Cayman. In its characters, however, *D. v. nelsoni* of Swan Island is more or less intermediate, and the two extreme forms are those of Grand Cayman and of the two smaller islands of the Cayman group.

DENDROICA VITELLINA CRAWFORDI Nicoll.

Dendroica crawfordi Nicoll, Bull. B. O. C., 1904, **14**, p. 95. Ibis, 1904, ser. 8, **4**, p. 586, pl. 11, fig. 1. Little Cayman Island.

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[1] Ridgway, Birds of North and Middle America, 1902, pt. 2, p. 611, in the synonomy of *D. vitellina* gives his second reference to the species as —(Cory, Auk) "IV, 1887, 181 (St. Andrews I. Caribbean Sea)." Turning to the page of the Auk quoted I find Cory's list of the birds of St. Andrews Island, but no mention of *Dendroica vitellina!*

Characters.— Besides differing from *D. v. vitellina* exactly as *D. v. nelsoni* does, this form differs from both in having paler, yellower, less greenish upper parts — pyrite-yellow; and deeper yellow under parts, superciliaries and sides of face — intense lemon-chrome.

Measurements.— Little Cayman Island, adult ♂, wing, 57 (55–59); tail, 49.7 (46–53); tarsus, 18.3 (17.5–19); exposed culmen, 11.2 (11–12). Adult ♀, wing, 54.9 (53–57); tail, 48.5 (47–51); tarsus, 18.2 (17–19); exposed culmen, 10.9 (10.5–11). Cayman Brac Island, adult ♂, 56.4 (55–58); tail, 49.2 (47–52); tarsus, 18.2 (17–19); exposed culmen, 11 (10.5–11.5). Adult ♀, wing, 52.5; tail, 47; tarsus, 17.5; exposed culmen, 11. (One female only).

Remarks.— *D. v. crawfordi* is confined to the two neighboring islands of Little Cayman and Cayman Brac. The M. C. Z. series consists of twenty-three specimens from Little Cayman, including adults in summer and autumnal plumage and young in first autumnal dress. From Cayman Brac there are fourteen adults in summer plumage. All were collected by W. W. Brown Jr.

Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
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THE PHORIDAE OF GRENADA.

By Charles T. Brues.

CAMBRIDGE, MASS., U. S. A.:
PRINTED FOR THE MUSEUM.
February, 1919.

No. 12.— *The Phoridae of Grenada.*

By Charles T. Brues.

CONTRIBUTIONS FROM THE ENTOMOLOGICAL LABORATORY OF THE BUSSEY INSTITUTION, HARVARD UNIVERSITY, No. 144.

The small island of Grenada lies at the southern end of the windward group in the West Indies. In spite of its proximity to Trinidad which supports a continental fauna, the insect inhabitants seem rather limited in number of species. When I visited this island in 1910 for another purpose in behalf of the Museum of Comparative Zoölogy, I had the opportunity to collect a number of insects some of which belong to the Phoridae. I was particularly interested in these small flies at the time, and brought back specimens representing nine species. Mr. H. H. Smith collected many insects in Grenada some twenty years before and obtained several species two of which I failed to find in 1910.

The following list includes the known species from the island including three which are new to science.

Paraspiniphora scutellata Brues.

The type of this species which is a female is from Grenada. I collected a male in 1910, which differs in having the anterior scutellar bristle much smaller than the posterior one. This is probably a sexual character.

Dohrniphora venusta Coquilett.

This is common in Grenada as in most parts of the American tropics. From specimens collected in Grenada and St. Vincent by H. H. Smith it was redescribed as *divaricata* by Aldrich. It was also obtained in Grenada by Busck and myself.

Dohrniphora alleni, sp. nov.

Type.— M. C. Z. 7,005. Grenada, C. T. Brues.

♂. Length 3.5 mm. Black; pleurae and base of middle coxae piceous, antennae fuscous, palpi reddish brown; legs dull brownish yellow; hypopygial projection yellow; wings tinged with brown, venation piceous. Front as broad as high; carinate above the median pair of ocellar bristles, the carina curving down laterally below the lateral ocellar bristles; postantennal pair of bristles close together, not far below the level of the next row which form a nearly equidistant series curved downwards medially; upper row slightly curved upwards medially; ocelli not on a tubercle; all frontal bristles large. Postocular cilia enlarged at upper two thirds of eye. Cheeks each with two macrochaetae. Antennae small, nearly round; arista nearly twice as long as the front. Palpi not enlarged, with stout bristles below on apical third. Mesonotum shining, pubescent, slightly bristly along the sides; one pair of dorsocentral bristles. Scutellum short and broad; posterior pair of bristles far apart and very long, anterior pair much smaller. Propleurae hairy, with two bristles near the coxa and one large one midway between the coxa and spiracle; also a bristle above the spiracle; mesopleura not hairy. Abdomen with second and sixth segments elongated; third, fourth, and fifth subequal in length; surface dull except at apex, without hairs except a few on the sixth segment which also bears some bristles on posterior edge; hypopygium rather small; projecting piece slender, bearing only a few very small hairs towards apex. Legs stout; front tibia with a small bristle just beyond basal third, but no others; middle tibiae with a pair at basal third and a small one on anterior surface just before apex; anterior surface on apical third with transverse comb-like rows of very short bristles; hind tibiae with a shorter patch of similar comb-like rows at apex, without bristles or setulae before apex although the hairs are larger on the seam and just outside it on the apical half of the tibia; hind femur without a patch of short bristles on inner side at base. Wings long and narrow; two and one half times as long as broad; costa extending to the middle or barely beyond; first section of the costa twice as long as second and third together, third nearly as long as second; fork rather acute; fourth vein feebly curved, recurved at apex; fifth nearly straight; sixth sinuate; seventh strongly curved basally; costal cilia rather short, about as long as the humeral cross-vein. Halteres light fuscous.

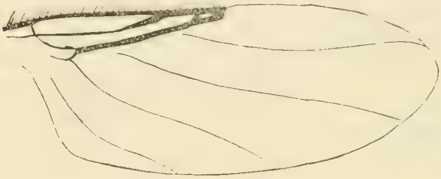

Fig. 1.— Dohrniphora alleni Brues. Wing.

Named for Dr. G. M. Allen, my companion in Grenada on the trip when the specimen was collected.

Since this was written I have seen additional specimens from Falls Church, Va., collected by Mr. Nathan Banks.

This species resembles *D. incisuralis* and *D. venusta* in the presence of pale color on the body, but is more closely similar structurally to *D. concinna* and its relatives except in the bare hind tibiae. It is related to *D. setigera* Malloch, but is without setulae on the hind tibiae, has shorter costal cilia and paler halteres.

The species of Dohrniphora known from North and Central America may be distinguished by the following key:—

1. Front tibiae with a serial row of four or five small, erect setae of subequal size; no bristle on prothorax just above spiracle . . 2.
   Front tibiae with one bristle at basal third and without additional setulae, prothorax with a bristle just above the spiracle; mesopleura entirely bare . . . . 5.
2. Head tibiae without any setulae . . . . 3.
   Hind tibiae with four or five serially arranged setulae on outer side . . . . *D. incisuralis* Loew.
3. Black; legs brown, front pair varied with yellowish. *D. knabi* Malloch.
   Thorax yellow, at most with the dorsum darker, hind femora of male with a small patch of bristles on inner side near base . 4.
4. Antennae not enlarged, of normal size . . . *D. venusta* Coquilett.
   Antennae enlarged in both sexes; those of male pyriform. *D. dispar* Enderlein.
5. Hind tibiae with some minute setulae on inner, outer, or on both sides; palpi and legs usually black . . . . 6.
   Hind tibiae without setulae before apex; palpi and legs yellowish brown . . . . *D. alleni* Brues.
6. Hind tibiae with setulae only on outer side; male antennae not noticeably enlarged . . . . 7.
   Hind tibiae with a series of setulae on inner side as well as on outer; male antennae much enlarged . . . . *crassicornis* Meigen.
   Hind tibiae with a series of short setulae inside the seam; legs pale . . . . *D. setigera* Malloch.
7. Front quadrate; postantennal bristles below the next row by more than half the distance separating this row from the upper row; halteres black; sixth segment of male strongly bristly. *D. cimbicis* Aldrich.
   Front distinctly wider than long; postantennal bristles below

the next row by less than half the distance separating this row from the upper row; halteres pale; sixth segment of male faintly bristly (*nitidifrons* Brues) . . . . *D. concinna* Meigen.

HYPOCERA GRENADENSIS Brues.

The type is from Grenada, collected by H. H. Smith.

CONICERA NEOTROPICA Brues.

Originally described from a specimen taken in Grenada by H. H. Smith.

BECKERINA NEOTROPICA, sp. nov.

Type.— M. C. Z. 7,006. *Paratype.*— Grenada; Grand Etang, 2,500 ft.

♀. Length 2.6 mm. Pale brownish yellow; front black except near lower margin; abdomen infuscated at base and with blackish apical bands on the segments; legs pale yellowish, hind femora blackened at tip; wings slightly tinged with yellow; halteres with pale stalk and fuscous club; antennae fuscous; palpi pale yellow. Front with ocellar tubercle and well-marked median groove; almost as high as wide, but appearing shorter as the lower edge is more strongly produced medially than usual. Two postantennal bristles which are slightly curved upwards although nearly erect; next row complete, of four bristles, forming a line curved down medially, with the median pair farther from one another than from the lateral one, all close to the lower margin; next row similarly curved, of four nearly equidistant bristles; ocellar row of large bristles as are the others; in addition to the large bristles there are scattered small ones especially noticeable along the lower edge, with two somewhat larger just above the pair of postantennals. Postocular cilia large, cheeks each with three macrochaetae. Antennae small, round, arista nearly twice as long as the front. Palpi small, strongly bristled on apical half, weakly so nearer the base. Mesonotum with six rather small bristles in a nearly straight line near posterior margin. Scutellum short, transverse, with four large, equally strong bristles on the margin, the median pair approximated, much less than twice as far from one another as from the adjacent lateral one. Propleura bristly behind, with two large bristles next the coxa and four less enlarged above near the spiracle; a bristle directly above spiracle. Mesopleura entirely bare. Abdomen with a tuft of bristles at sides of second segment and a row of minute ones along the posterior margin of each segment. Legs large, but not especially stout, all tibiae without bristles or setulae before apex; hind tibiae but not middle ones with a small patch of transverse comb-like rows of bristles inside at apex; tarsi slender. Wings small, broad basally, but much narrowed beyond middle; costa extending to slightly beyond middle of wing, the third vein widely separated from the costa; costal cilia rather short, closely placed; first section of costa scarcely longer than the second and third together, second twice as long as third, fork not very acute, the cell thus formed rather large, fourth vein evenly bent, not recurved at tip; fifth vein nearly straight; sixth faintly bisinuate; seventh nearly straight.

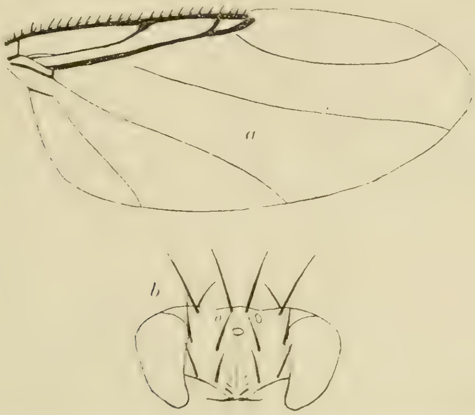

Fig. 2.— Beckerina neotropica Brues. a, wing: b, front showing chaetotaxy.

This peculiar species is probably referable to Beckerina although the bristling of the front is complete, with four bristles in the lower row, not two as occur in *B. orphnephiloides* Malloch. I have not seen the other member of the genus, *B. umbrimargo* Becker of Europe, but as nearly as I can gather from Becker's description the frontal chaetotaxy of that species is similar to the present one from Grenada. The tibiae are without bristles as in Aphiochaeta and do not even show the small setulae usually present on the hind pair in that genus.

APHIOCHAETA CARIBBAEA, sp. nov.

Type.— M. C. Z. 7,007. Grenada, H. H. Smith.

♀. Length 2.2 mm. Dull yellow, with the front and antennae black, and the abdomen much infuscated, especially at the base and apex, but with the apical margins of all the segments pale; legs pale yellowish, the posterior femora darkened at tips; wings with a yellowish cast, veins light brown, the light veins strongly colored; halteres pale brown. Front quadrate, with strong bristles; four proclinate bristles, the lower pair nearly as large as the upper and half as far apart; upper pair occupying nearly one third of the width of the front, far above the lower pair and a little above the inner bristles of the lower reclinate row; outer bristle of the lower reclinate row next to the eye and well above the inner bristle which is far from the eye; upper reclinate row of four equidistant bristles with the median pair slightly lower than the lateral bristles; ocellar tubercle prominent; median frontal groove rather indistinct; cheeks each with a pair of bristles and several small ones running up the inner orbit toward the antennae. Antennae rather small; arista strongly pubescent, scarcely twice as long as the height of the front; palpi large, compressed, with several large bristles below on apical third and some much smaller ones before these. Mesonotum somewhat shining, the dorsocentral machrochaetae present, with not much larger than a row of smaller bristles that extends between them. Scutellum subtriangular, with four large, equal bristles. Propleura with several rather slender bristles next the front coxa and some smaller ones above, several scattered over the disc and several next the spiracle; mesopleura with a patch of fine hair-like bristles above and one much larger one at the posterior edge of the group of small ones. Although much larger than the others, this bristle is not so large as in some other species like *A. juli.* Abdomen with distinct bristles at the sides of the second segment. Legs rather stout; fore tarsi slender; hind tibiae with very small cilia on the basal half, those on the apical half moderately well developed although delicate and placed far apart. Wings long and narrow, the costa extending well beyond the middle, costal cilia quite short, especially at the base; first section of costa, barely shorter than the second and third combined; second three times as long as the third; fork of third vein moderately acute; fourth vein gently curved at both base and apex; fifth almost straight; sixth slightly bisinuate; seventh long, nearly straight.

This is related to *A. arcuata* Malloch from the eastern United States, but is easily separable by the chaetotaxy of the front and by the fact that only one mesopleural bristle is large. In the latter respect it resembles *A. juli* Brues and *A. perdita* Malloch from both of which it is otherwise very different.

APHIOCHAETA MAGNIPALPIS Aldrich.

This species was described from specimens taken by H. H. Smith in St. Vincent and Grenada. I collected it again in Grenada. It is a peculiar little species with the mesopleura bare above and the front tarsi noticeably enlarged, especially in the male. It may be easily recognized by the bare, greatly enlarged palpi of the male and by the almost parallel course of the fifth and sixth veins in the wing.

APHIOCHAETA AUREA Aldrich.

Originally described by Aldrich from specimens obtained by H. H. Smith in St. Vincent, but also collected by him in Grenada. It appears to be a common species in Grenada as I took numerous specimens of each sex in the high central part of the island.

APHIOCHAETA AUREA SETIGERA, subsp. nov.

Type.— M. C. Z. 7,008. Grenada, H. H. Smith.

♀. Length 2 mm. Very similar to the typical *A. aurea* Aldrich, but with a distinct patch of very small bristles at the upper angle of the mesopleura; these are not numerous, but always present. It also differs in having the wings without the deep yellow cast and the abdomen without the brilliant orange color usually so noticeable near the center of the abdomen in the typical form.

Type and three paratypes from Grenada, B. W. I. (H. H. Smith). Two were taken at 500 ft. altitude and the altitude is not indicated on the other labels.

This is so similar to *A. aurea* that it can hardly be considered as a distinct species in spite of the bristly mesopleura which is ordinarily a most satisfactory character. I suspect that it is characteristic of the lower and drier hills while *A. aurea* is restricted to the higher, moist mountain region as the specimens of the latter which I have labeled as to altitude came from stations at 1,000, 1,500, and 2,500 feet.

APHIOCHAETA SCALARIS Loew.

A common, widespread species in the warmer parts of America. Taken in Grenada by both Smith and myself. The specimens in both lots are rather small but otherwise typical.

APHIOCHAETA SUBFLAVA Malloch.

Of this species described from Porto Rico, I took a number of specimens in Grenada. It is very close to *A. scalaris* and quite possibly not entitled to specific rank.

PULICIPHORA VENATA Aldrich.

The male of this species was described from a specimen collected by H. H. Smith in St. Vincent. I found both sexes to be very abundant at the Grand Etang in Grenada at an altitude of 2,500 feet. The males were to be seen running on the inside of the glazed windows of the house and the females were attracted in numbers to traps placed out of doors. The traps consisted of glass jars sunk into the ground in the forest and baited with chicken bones. On visiting the jars, the Puliciphoras were found running over the surface of the glass and bait to which they were undoubtedly attracted by the carrion-like odor. Whether they oviposited in the material could not be determined and there was no opportunity to attempt rearing them at the time.

I have not undertaken to describe the female as it is very similar to those of several other species and the genus needs critical study. It differs from *P. borinquenensis* Wheeler from Porto Rico in its broader and shorter thorax and in the more complete chaetotaxy of the head. From the Mexican *P. incerta* Silvestri of which I have seen no specimens, it appears to differ in the same characters, as well as in the form of the abdominal tergites.

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THE AMERICAN COLLARED LEMMINGS (DICROSTONYX).

By Glover M. Allen.

With One Plate.

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February, 1919.

No. 13.— *The American Collared Lemmings* (*Dicrostonyx*).

BY GLOVER M. ALLEN.

INTRODUCTION.

THE Collared Lemmings of the genus Dicrostonyx are circumboreal in distribution and highly characteristic of Arctic lands. In the Old World, they inhabit Spitzbergen, Nova Zembla, and the Asiatic continent bordering the Arctic Ocean, but in comparatively recent geological times (late Pleistocene) they were present in Great Britain and on the European continent as far south at least as Belgium, central France, and Germany, evidently forced southward by the encroaching ice-cap during the last period of glaciation. Associated with the fossil remains of Dicrostonyx in Europe, are those of reindeer, musk ox, the Common Lemming (Lemmus), and other tundra-loving species characteristic of Arctic and Subarctic country. With the return of a warmer climate, this barren-ground fauna has retreated northward so that at the present time the Collared Lemming is no longer found in Europe, though it reaches western Siberia in the Obi region. Of the former distribution of the genus in Asia and in the New World, no positive evidence has as yet been discovered. No doubt, however, it was driven southward at the same time that the ice-sheet overspread Europe and northern America, and it may have lived with the musk ox and reindeer, the fossil remains of which are found in the central states.

The present distribution of Dicrostonyx in America is suggestive of Postglacial change. Two types now occur; a more primitive confined to the Labrador Peninsula; and a more evolved, similar to the fossil and living Asiatic type, the range of which includes western Arctic America, west of Hudson Bay, the Arctic Archipelago, and the north coast of Greenland. Associated with this type in continental Asia and in America west of Hudson Bay is the genus Lemmus, or typical Lemming, also of Arctic and Subarctic distribution. The isolation of the Labrador Lemming and the absence from that peninsula of the boreal genus Lemmus, suggest that the Labrador animal is a relict that still persists there, having followed the ice-sheet in its retreat northward. The concomitant advance of the forest to James Bay effectually cut off its range from invasion by tundra-living animals coming in from the west. If we assume that the Labrador Lemming represents the original American stock, we may further postulate that it became wiped out west of Hudson Bay, either by unfavorable conditions at the south of the great ice-sheet in glacial times, or more probably, by a subsequent invasion from the Old World of the more highly specialized type which now prevails, associated with Lemmus of somewhat similar habits. The common ancestry of the two types must therefore be sought still farther back in time. Such an invasion by Old World genera was possible in late Pleistocene times when "a broad land bridge with Asia existed, and the continental shore line extended far north into the present Arctic Ocean" (Osborn). The possible former existence in Europe of a lemming with teeth like those of the living Labrador species, is suggested by the figures of Hensel (1855, pl. 25, fig. 12), drawn from Pleistocene specimens from Quedlinburg, Germany; he admits that they are not wholly accurate, yet his description corroborates the general features indicated. Sanford (1870) too has figured the lower jaw of a lemming from the cave-deposits of Somerset, England, which if correctly drawn, resembles that of the Labrador species in lacking the antero-internal accessory lobe of enamel in the last molar.

Until twenty years ago, it was customary to refer the Collared Lemmings of both Old and New Worlds to the single species, *torquatus*, described by Pallas in 1778, from northwestern Asia. The same author, however, pointed out the color-characters distinguishing the Labrador species, which he named *hudsonius;* yet it was not until 1897 that the distinctness of this species was generally recognized. Three years later, in 1900, Dr. C. Hart Merriam described as new species the Collared Lemmings of Alaska, Unalaska, and the west side of Hudson Bay. The status of these forms has since remained uncertain, and recent writers have usually grouped them as subspecies of *hudsonius*. The excellent series of Dicrostonyx from Arctic America in the Museum collection has induced me to undertake a revision of the American forms in an attempt to define more clearly their relationships and distribution. I have had for examination, in addition to the series in the M. C. Z., nearly all the specimens available in the United States; yet there is still a great lack of material, particularly of summer skins, from the archipelago north of Hudson Bay, and from the Alaskan Peninsula. The Old World species are almost unrepresented in American museums, so that it has been impossible to consider them in any revisionary way.

All the species turn white in winter, so that for any study of geographic variation in color, only those specimens that have acquired the full summer coat are of value. Until very recently there have been few such specimens available in America, so that no comparisons of color have hitherto been made except between the Labrador species and its neighbor on the west side of Hudson Bay. This has continued to obscure our conception of the relationships of the different forms.

By way of summary, the Labrador Lemming, *D. hudsonius*, is found to be a species distinct from any of the Old or New World forms, and is confined to the Labrador Peninsula and the immediately adjacent islands. Its tooth-structure is less complex than that of the other known Collared Lemmings, and the young in summer are hardly differ-

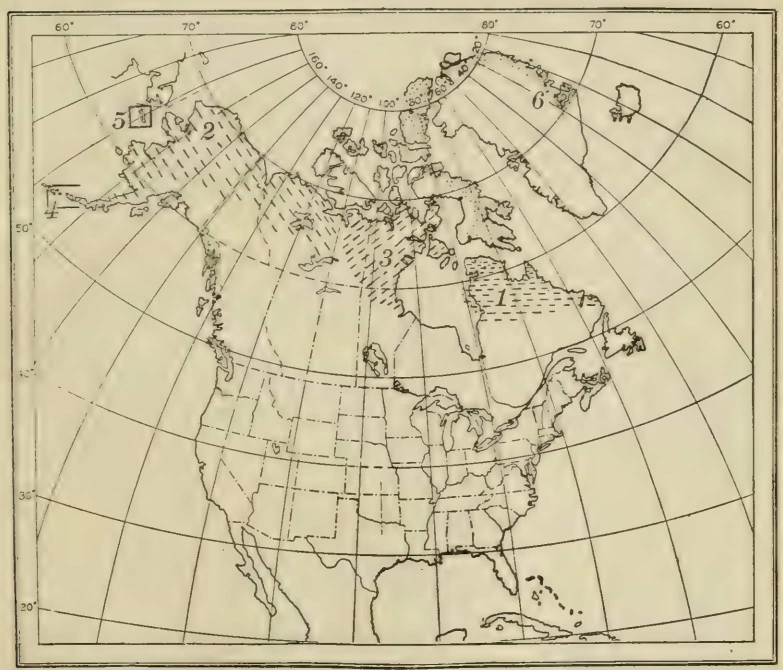

FIG. 1.— Distribution of the American Collared Lemmings. *1.* Dicrostonyx hudsonius (Pallas). *2.* D. rubricatus (Richardson). *3.* D. r. richardsoni Merriam. *4.* D. r. unalascensis Merriam. *5.* D. exsul G. M. Allen. *6.* D. groenlandicus (Traill).

ent in color from the adults. At the other extreme of development is the Alaskan Lemming, which has an additional enamel lobe on certain of its molars, and in summer has in the adult a brilliantly variegated pelage. It merges by insensible degrees into the subspecies *richardsoni,* the type of which is from Fort Churchill, west coast of Hudson Bay. This is a nearly uniform ruddy-gray race, quite different in color from the Alaskan form. On the west, the animal of Unalaska Island has been named as a distinct species and all too briefly diagnosed from skulls, but it will probably be found to represent at most a subspecies of the Alaskan Lemming. The lemming of St. Lawrence Island, Bering Sea, is here described as new. It is a gray, pallid member of the Alaskan Lemming group. The Greenland Lemming, so far as present evidence goes, seems to be a species distinct from any of its neighbors, though it may yet be found to intergrade with the Alaskan species, of which it is perhaps a depauperate form. The Labrador Lemming, on account of its less degree of specialization in color and in tooth-structure, is possibly to be regarded as the most ancestral of the living forms, and has probably been isolated for a long period.

For the loan of specimens, including the type of *D. unalascensis,* I am particularly indebted to the U. S. Biological Survey and the U. S. National Museum; thanks are also due to Dr. J. A. Allen of the American Museum of Natural History; the Carnegie Museum of Pittsburgh through Mr. O. J. Murie; Dr. Joseph Grinnell of the Museum of Vertebrate Zoölogy of the University of California; and the Field Museum of Natural History.

Generic and Subgeneric Characters.

The genus Dicrostonyx has been sufficiently characterized by Miller (1896, p. 38). It is an arvicoline, externally modified for subterranean life by its short tail, much reduced ear conch, and powerful third and fourth claws of the fore feet. These claws become singularly enlarged in winter, so as to appear double, by the great enlargement of the ventral portion of the claw in a vertical direction. The thumb is very greatly reduced. It is the only known true rodent (the hares and rabbits are now considered a separate order, Lagomorpha) that becomes white in winter, an adaptation to its Arctic habitat.

The broad flat skull is characterized by a peculiar pointed process projecting forward from the posterior rim of the orbit. The interorbital borders become ridged with age, but the two ridges never meet even in aged individuals but preserve a shallow groove medially. The molar teeth are characterized by their alternating triangular enamel prisms, and by the presence of a small supplementary enamel loop at the postero-*external* end of the first and second upper molariform teeth, and at the antero-*internal* corner of the first lower molar (m_1).

Two superspecific groups are readily recognizable, and have the value of subgenera. The one is represented by the Labrador Lemming, and is the typical subgenus, since Gloger's Dicrostonyx was based, probably, on Pallas's *Mus hudsonius* (see Miller, 1896, p. 38). The other group includes the remaining living forms of Asia and America so far as at present known. The earliest available name applied to this group is Misothermus of Hensel (1855) who used the term in a generic sense, and particularly specifies *Myodes torquatus* as the type, basing his distinctions largely on Middendorf's figures. These two subgenera may be distinguished as follows: —

DICROSTONYX: — first and second upper cheek-teeth without a minute accessory enamel fold at the postero-*internal* corner; both of these teeth terminate with a posteriorly convex transverse outline. Last lower cheek-tooth (m_2) normally lacking an accessory antero-internal and antero-external enamel fold.

MISOTHERMUS: — first and second upper cheek-teeth with a very small accessory enamel fold at the postero-*internal* corner; the posterior outline of the last inner triangle of each tooth concave forward. Last lower cheek-tooth provided with an accessory antero-internal enamel fold, and, in some forms, with an antero-external accessory fold.

FOSSIL COLLARED LEMMINGS.

As previously noted, Hensel (1855) figures and describes the upper cheek-teeth of a fossil Collared Lemming from Quedlinburg, Germany, in which according to both description and figure, the typical Dicrostonyx pattern is present. Since he expressly states, however, that his figure is not quite accurate, the account needs confirmation before this subgenus is admitted in the Old World fauna. Other fossil remains from the Pleistocene of Great Britain, France, and Germany, seem to represent Misothermus. Two jaws examined from the

Diluvium of Elizabeth Höhle, Oberfranken, Germany, resemble the Greenland Lemming — a Misothermus — in lacking the *external* accessory lobe at the anterior end of the last lower molar, though the *internal* lobe, characteristic of the subgenus, is present. Sanford (1870) describes as *Arvicola gulielmi* the fossil lower jaw of a Dicrostonyx from England, in which the last molar (Sanford, 1870, pl. 8, fig. 2b) seems to lack the small antero-internal enamel fold characteristic of the subgenus Misothermus. The anterior outer fold, however, is represented as strongly convex forward, so that it differs from any of the known species and may not be accurately drawn. A careful re-examination of all the fossil material available from Europe is much desired to establish whether or not both subgenera are represented there.

The following American Collared Lemmings are recognized: —

DICROSTONYX HUDSONIUS (Pallas).

Labrador Collared Lemming.

Mus hudsonius Pallas, Nov. spec. Quad. Glir. ord., 1778, p. 208, pl. 26, fig. A, B, C.
Spalax hudsonius Tiedemann, Zoologie, 1808, **1**, p. 478.
Arvicola (*Georychus*) *hudsonius* Cuvier, Règne anim., 1817, **1**, p. 207.
Lemmus hudsonius Desmarest, Mammalogie, 1820, p. 289.
Hipudaeus hudsonius Lesson, Man. mammalogie, 1827, p. 277.
Hypydaeus hudsonius Fischer, Synopsis Mamm., 1829, p. 299 (misquotation).
Myodes hudsonius Wagner, Schreber's säugethiere. Suppl., 1843, **3**, p. 604.
Lemnus (sic) *hudsonius* Schinz, Synopsis Mamm., 1845, **2**, p. 255.
Georychus hudsonius Audubon & Bachman, Quad. N. Amer., 1854, **3**, p. 81 (part).
Myodes torquatus var. *hudsonius* Major, Atti Soc. Ital. sci. nat. Milano, 1872, **15**, p. 122, pl., fig. 1, 2 (teeth).
Cuniculus hudsonius Coues, Proc. Acad. nat. sci. Phila., 1874, p. 196 (part).
Cuniculus torquatus Coues, Monogr. N. Amer. Rodentia. Muridae, 1877, p. 246 (part).
Dicrostonyx torquatus Miller, N. Amer. fauna, 1896, no. 12, p. 38–40 (part), fig. 13 (teeth).
Dicrostonyx hudsonius Bangs, Proc. Biol. soc. Washington, 1897, **11**, p. 237.

Type.— Pallas based this species on sundry skins sent from Labrador by the Moravian missionaries ("Fratrum evangelicorum") and hence probably from the east coast.

General characters.— Above, in summer, a nearly uniform buffy gray; a median blackish line from the nape to tail, not sharply defined; ear-tufts, sides of the body, and throat buff; belly gray. Pattern of anterior two upper molariform teeth characteristic in lacking the small postero-internal lobe found in other American species; the last lower molar likewise lacks a supplementary antero-internal fold. Posterior process of parietal usually not extending back on the cranial surface to supraoccipital.

Color.— *Adult in summer:* — general tone of upper parts, including the head, a buffy gray, varying to nearly clear gray, a result of the mixture of three sorts of hairs: some gray-tipped, others gray with a buffy to ochraceous subterminal band and black points, and still others longer and entirely black. The bases of the hairs are slaty, and the intensity of the buffy tone depends on the greater or less development of the subterminal buffy or ochraceous ring in the second sort of hairs. A median black line extends from the forehead to the tail, but is not sharply defined. The ears are marked by a tuft of tawny hairs, surrounded by an indistinct grayish patch. A wash of tawny extends from the axillae across the throat, sometimes continued medially to the chest. A paler tint of the same extends along the sides and about the anal region. A buffy spot on each side of the nose and around the eye. Tail like the back or with a tuft of long gray hairs.

Young in summer: — immature specimens are nearly similar to adults, but of a darker, less clear gray; the black median line is more sharply defined and extends to the point of the nose. The tawny collar is very indistinct.

Winter pelage: — white throughout, the bases of the hairs slaty.

Skull.— In the shape of the interparietal, with its two anterior sides sloping distinctly forward to a median peak (Plate 1, fig. 4) this species resembles the Greenland Lemming and the Alaskan species, but the upper border of the squamosal frequently abuts against the extreme lateral edge of the interparietal, whereas in the other American species, a narrow tongue of the parietal usually separates the two bones. The nasals are relatively long, and equal or slightly exceed the ascending branch of the premaxillary in backward extension. With age, as in the other species, an angular ridge develops along the outer edge of the parietal region, and thick, rounded supraorbital ridges border the upper margin of the orbit, increasing in size in old animals till they nearly meet.

The teeth differ remarkably from those of any known species in the lack of the small postero-internal lobe in the two anterior upper cheek-teeth (Plate 1, fig. 1). This character, which seems first to have been pointed out by Major (1872), sharply separates *hudsonius* from other American species. The posterior lower molar (Plate 1, fig. 6) normally lacks the small antero-internal enamel fold that is present in the other continental species, so that there are but two closed spaces on each side.

Measurements.— Six adults from Labrador average as follows:— total length 148 mm., tail 20.3, hind foot 22.1. The largest specimen, a female from Nain, Labrador, measures 160, 22, 24 for these three dimensions.

The skull of the latter (Carnegie Mus. 1,124) measures: greatest length 32 mm., basal length 30.5, palatal length 18.7, nasals (median length) 10, zygomatic width 21.3, mastoid width 16, interorbital width 4.8, upper tooth-row (alveoli) 8.6, lower tooth-row (alveoli) 7.8.

Molt.— A certain amount of individual variation in the time of molt is to be expected, and there is also variation in progress of the change in different parts of the body. In the series studied, an April 5th specimen from the Belcher Islands, Hudson Bay, is beginning to show a yellowish wash over the head, lower back, and rump, where the new hairs with their buffy subterminal rings appear among the old white hairs of winter. A thin sprinkling of new black hair-tips darkens these parts slightly, while at the nape they form a narrow stripe. The enlarged fore claws have disappeared. An adult from Great Whale River, Hudson Bay, April 20th, still retains the enlarged fore claws, but shows a dark forehead and a blackish line from the nape almost to the rump, with a buffy appearance of new hairs in a narrow area over the shoulders on either side. Elsewhere, the white coat of winter is retained. In a specimen from Nastapoka River, May 8th, the long white winter pelage is retained in small tufts behind each ear, on the sides of the abdomen, the hips, and rump, and below in a narrow band across the chest. Scattered white hairs elsewhere give a gray tint to the head, neck, and fore shoulders, but in the center of the back is a small oval patch of the fully developed brownish summer coat. The dark line down the back is not present except in the center of this patch. A second skin from the same locality, June 1st, retains a little patch of long white hair just behind each shoulder, on the left hip, and on the rump and lower leg. Elsewhere the summer pelage is nearly matured, and the enlarged fore claws are nearly ready to fall away. The retention of the winter pelage in patches or irregular areas is apparently characteristic of old and less vigorous individuals, whereas in the younger though mature animals, the change takes place much more regularly. In these a sharply outlined area of newly grown hairs spreads from the median area of the back, laterally, or more exactly, the white winter pelage gradually drops out as the new hair comes in, disappearing first from the nape and shoulders and last along the sides. A nearly full-grown, but not old, specimen taken May 10th at Nastapoka River shows a narrow gray band along each side, in which the new fur is still mixed with the remnants of the white pelage of winter, yet the latter seems to have been shed at about the same rate that the new has come in, and the new hair by its rapid growth has nearly equalled the old in length. The result is a pale gray, due to the even mixture of the two, sharply defined from the dorsal area of wholly new fur, and quite without the ragged effect seen in old animals in which the slower maturity of the new coat causes the remnants of the older and longer hair to stand out in patches. No series illustrative of the fall molt is available. A young one, taken May 1st, at Richmond Gulf, Hudson Bay, is but 86 mm. long, and must have been born in March or April. It is in the summer pelage, which is doubtless the older phylogenetically.

Geographic distribution.— This species is confined so far as known to the barren-ground area of the Labrador Peninsula, from (probably) the Straits of Belle Isle on the southeast to about the latitude of Great Whale River (55° N.) on the west side. It is also found on some of the small islands along the eastern side of Hudson Bay, but on the west side of the bay its place is taken by *D. r. richardsoni.* Between the ranges of these two species, James Bay intervenes, the borders of which are unsuited for lemmings on account of their wooded character. In the interior of the Labrador Peninsula the details of distribution are yet to be worked out. Low, however, reports it from Lake Michikamau. On the eastern coast it is not uncommon from Hamilton Inlet northward, and probably continues farther south following the barren Arctic strip along the coast to the Straits of Belle Isle (52° N.) Near Battle Harbor in 1906, I found in several places on the neighboring Great Caribou Island, the rather characteristic deposits of dung made during winter in certain parts of their tunnels under the snow. It is unlikely that lemmings cross Hudson Strait with its baffling counter-currents. Those that attempted it would probably be carried to the Atlantic, or back on the northern side of the Strait toward Hudson Bay. Along the west coast of the Labrador Peninsula, Mr. O. J. Murie has lately taken *hudsonius* at several points from Great Whale River northward, as well as on the Belcher Islands adjacent to that shore.

Remarks.— This species is so very distinct from all the others of the genus in its dental characters and its color, that I have regarded the differences as of subgeneric value. The resemblance of the young to the adult in summer, as well as the simpler condition of its enamel pattern, may indicate a less degree of specialization. Its geographic range is isolated, and there is no evidence that it intergrades with the nearest related forms.

The specific name is credited to Forster by Richardson, but though Forster mentions "a small animal called a Field Mouse" sent from Churchill River and describes its dark median line, he does not name it. Doubtless it was the race now known as *richardsoni*. Although successively placed in various murine genera by the earlier authors, this lemming seems to have escaped specific synonyms.

In the series examined, a single specimen (M. C. Z. 8,671) shows an interesting progressive variation in the development of a very small antero-internal accessory enamel fold in the last lower molar, a feature which is characteristic of the subgenus Misothermus.

Specimens examined, 41, from the following localities:—

Labrador.

Hamilton Inlet, Rigolet, 3 (M. C. Z.).
Indian Harbor, 1 (M. C. Z.) skull only.
Hopedale, 1 (U. S. N. M.).
Nain, 4 (M. C. Z.), 4 (Carnegie Mus.).
Okak, 3 (M. C. Z.).
Rama, 6 (M. C. Z.).
Fort Chimo, 4 (U. S. N. M.).
Port Burwell, 1 (M. C. Z.).
Nastapoka River, 6 (Carnegie Mus.).
Richmond Gulf, 1 (Carnegie Mus.).
Hopewell Sound, 1 (U. S. Biol. Surv.).
Great Whale River, 4 (Carnegie Mus.).
Belcher Islands, Hudson Bay, 2 (Carnegie Mus.).

DICROSTONYX RUBRICATUS (Richardson).

Alaskan Collared Lemming.

Arvicola rubricatus Richardson, Zoöl. Beechey's voyage, 1839, p. 7.
Hypudaeus rubricatus Schinz, Synopsis Mamm., 1845, **2**, p. 250.

Cuniculus torquatus Coues, Monogr. N. Amer. Rodentia. Muridae, 1877, p. 246 (part).

Dicrostonyx torquatus Miller, N. Amer. fauna, 1896, no. 12, p. 38–40 (part).

Dicrostonyx nelsoni Merriam, Proc. Washington acad. sci., 14 March, 1900, **2**, p. 25.

Dicrostonyx hudsonius alascensis Stone, Proc. Acad. nat. sci. Phila., 24 March, 1900, p. 37.

Dicrostonyx hudsonius nelsoni Elliot, Field Columbian mus. publ. Zool. ser., 1901, **2**, p. 210, fig. 48 (skull and teeth).

Dicrostonyx richardsoni Macfarlane, Proc. U. S. N. M., 1905, **28**, p. 736 (not of Merriam).

Type.— None specified; the name and description were based by Richardson on notes drawn up by Collie from specimens taken on the American side of Bering Strait, Alaska.

General characters.— Adults in summer, brilliantly colored, with dark backs, chestnut shoulders and sides, gray cheeks, and an indistinct black median line from nose to tail; belly whitish, usually washed with ochraceous-buff. Skull with squarely spreading zygomata; interparietal nearly rectangular in outline; first and second upper cheek-teeth each with a postero-internal accessory fold of enamel. There is a similar fold antero-internally on the last lower molar, with usually a smaller accessory lobe antero-externally, but this is not always developed, and is lacking in most young skulls.

Color.— *Adult in summer:* — sides of the muzzle and an area about the eyes gray, due to a mixture of short hairs some whitish, others black-tipped. Forehead from nose to the nape, black, sometimes grizzled with a few gray hairs. This mark is continued as a narrow black median stripe to the root of the tail. Ears marked by a tuft of rusty hairs. Shoulders nearly clear chestnut, about morocco-red of Ridgway (1912) mixed with whitish, this color extending back along the sides of the thorax, and blending dorsally with the grizzled whitish and blackish of the back; hips grayish. Lower surfaces usually washed with orange-buff, but in some specimens whitish. Tail and feet whitish.

Adult in winter: — pure silvery white, the hairs slaty at their bases.

Immature in summer: — young animals in first pelage lack the brilliant colors of the adults. The black dorsal stripe runs from the forehead or crown to the tail. The ear-tufts are black; and there is an ill-defined grayish patch below each eye and behind the ear. The rest of the upper parts is a uniform cinnamon-buff, the individual hairs chiefly tipped with ochraceous-buff, others with minute black tips, and others wholly black. A clear tawny patch at the shoulder. Sides and under surfaces washed with 'ochraceous-buff'; chin whitish.

Skull.— Compared with *D. hudsonius*, the skull shows a number of differential characters; yet these are of an average nature and do not hold in all cases where large series are compared. The tooth-characters, however, are trenchant, and sharply separate the two species. In *rubricatus* the two anterior upper cheek-teeth (Plate 1, fig. 2) have each an additional postero-internal fold of enamel and the last lower molar an antero-internal fold (Plate 1, fig. 8) which are uniformly lacking in *hudsonius*. In describing this species as *nelsoni*, Merriam speaks of the small and narrow bullae as distinctive, but these vary much in size in different specimens, and in a sufficient series of adult skulls offer nothing characteristic. Adults attain practically the same size in the two species, the characters of the jugal claimed by Merriam disappear in a series, and there is no appreciable difference in the length of the incisive foramina. But in general, *rubricatus* has shorter nasals, and slightly more squarely spreading zygomata; the anterior boundary of the combined parietals is more deeply emarginate medially, the interparietal is more nearly rectangular in outline, with a short median prolongation, and the posterior arm of each parietal usually extends as a narrow tongue between the squamosal and the interparietal to the supraoccipital boundary (Plate 1, fig. 5). The supraorbital ridges become prominent with age, and in some specimens practically touch on the median line. In others they become much thickened but preserve a shallow groove between.

In a series of forty skulls of *rubricatus*, no less than thirteen show a vacuity in the upper surface medially, between the frontals and the parietals, and this is often retained even in adults.

Measurements.— Five adults from Griffin Point, Alaska, were measured in the flesh by Mr. Joseph Dixon, as follows: —

No.	*Total length.*	*Tail.*	*Hind foot.*
11,389	152	20	20
11,830	157	17	22
11,833	150	20	20
11,834	156	20	20
11,842	150	18	19
Average	153	19	20

The skull of a fully adult animal (M. C. Z. 11,850) measures: greatest length 30.3 mm.; basal length 28.8; palatal length 17.3;

nasals, medially, 8.5; zygomatic breadth 20.7; interorbital breadth 4; mastoid breadth 14.8; upper molar row (alveoli) 8.2; lower molar row (alveoli) 7.7.

Molt.— As in *D. hudsonius,* there is much individual variation in the time of molt, due to age, vigor, or other causes. Specimens in various transitional stages of molt from the pure white of winter to the brilliant coat of summer often present a very peculiar appearance. A large series from Point Barrow, Alaska, illustrates very well the course of the spring change. Midwinter specimens are pure white, the bases of the hairs slaty. There is sometimes a slight yellowish wash along the hips. In March, the first indication of the change is seen in a pale yellowish tinge along the top of the head and fore-part of the back, where by parting the fur, the tips of the new hairs are seen nearly reaching the level of the winter coat, their buffy rings and minute black tips giving the soiled appearance. A March 11th specimen from Point Barrow is in this condition. By early April this yellowish wash overspreads the top of the back, except the rump. By middle or late April a narrow brownish dorsal stripe is discernible and an oval area over the back is decidedly yellowish or pale brown medially. During May the new hair grows in and the white hair disappears from the central part of the back progressively toward the sides, until by the first week of June, the full summer coat is complete. The gradual course of the replacement of the white by the colored hairs produces a constant change in general tint of the coat according to the greater or less amount of dilution by the white hairs, though in old animals the change is less gradual, and irregular patches of white hair are retained much later, while the new hair on account of its slower growth is in marked contrast by its shortness.

The progress of the fall molt cannot be traced from the specimens available. A single immature male from Point Humphreys, September 28, 1913, is in an intermediate stage. The white winter hair has come in on the head and lower surfaces, and on a broad strip the length of the back, where, however, enough of the old coat still remains to produce an indistinct black median stripe and a buffy wash on the shoulders. Along the sides, the white hair is less developed, so that these parts are still brownish.

Several immature specimens from Griffin Point, collected by Mr. Dixon in June 1914, seem to be losing the first dull yellowish coat and acquiring the adult pelage. This apparently grows in from the sides and rump *toward* the median line, the converse of the seasonal changes. A complete series shows the gradual acquisition of the brilliant chestnut sides and grizzled dark back, with the progressive disappearance of the uniform colors of the young, until finally, only a patch on the forehead remains of the first coat. Other specimens of equal size, taken at about the same time, seem to be acquiring a summer pelage in normal fashion, but may be animals born earlier in the year, undergoing a second molt.

Geographic distribution.— In general, this species is found on the barrens of northern Alaska, including the peninsula and eastward along the Arctic coast of Mackenzie to Coronation Gulf. Nelson (1887, p. 278) found it from the mouth of Kuskoquim River, Bering Sea, northward. He obtained a few at St. Michael's, Norton Sound, and found it more plentiful about Bering Strait than at any other place he visited. It occurs on the islands of the Strait and coastwise to Point Barrow, and eastward. Nelson found it also on the Yukon River, above Fort Yukon; at Nulato, Anook, and Kotlik along the same river. There are specimens in the M. C. Z. from Herschel Island, and from Baillie Island. The limits of its range to the northeast are yet to be traced. It intergrades with the subspecies *richardsoni* in Keewatin, and may be found eventually to intergrade to the northeast with *groenlandicus*, though specimens are lacking to prove this. In southwestern Alaska it is apparently rare. Osgood (1904, p. 37) did not find it during the course of his investigations at the base of the Alaska Peninsula, but he records specimens from Nushagak, Bristol Bay, taken by McKay in 1881 to 1883. Still farther south, and out on the peninsula itself, a specimen was taken at Chignik, by Mr. J. T. Oliver in December, 1908 (U. S. Biol. Surv. 159,540). It is immature and in process of acquiring the white winter pelage. Anderson found it rare at Muller Bay. The specimens available are not sufficient to show whether these from more southern localities differ from those to the north in color.

Habits.— Writers on the natural history of Alaska agree in their observations that this species is characteristic of the tundra and barrens. Mr. Joseph Dixon, who obtained a fine series for the M. C. Z. at Griffin Point, Arctic Alaska, found them wary, and usually well hidden, living under the snow till June, when the vegetation starts. Toward spring they are likely to be found running about on the top of the snow, much more so than Lemmus. Mr. Dixon caught one on the ice at Demarcation Point on April 20, 1914, and in the same month two others were caught two and a half miles offshore on the ice. One killed June 5th at Griffin Point, had its mouth full of feathers and bits of shavings for its nest. The young seem to be born in late June and early July. Mr. Dixon found well-developed embryos in specimens as follows:—

June 7, one with five embryos.
June 10, " " eight "
June 13, " " seven "
June 14, " " eleven "
July 8, " " five "

The average of these five is seven + young to a litter, which seems to be greater than for the more boreal Greenland Lemming or the Richardson's Lemming. Macfarlane records (1905, p. 736) five embryos in each of two females from Mackenzie, taken June 26, 1865.

Murdoch (1885) records the Eskimo belief that they drop from the clouds, on account of their noticeable appearance in white winter pelage at the time of the first snows in fall.

Remarks.— By a curious coincidence, both Dr. C. H. Merriam and Dr. Witmer Stone described the Alaskan Collared Lemming as new, in 1900. Their papers appeared within a few days of each other, but Dr. Merriam's was published first and his name, *nelsoni*, has since been used for this animal. As long ago as 1839, however, Richardson briefly characterized a microtine on the basis of Surgeon Collie's manuscript notes, as *Arvicola rubricatus*. Diagnoses in both Latin and English are given, and the latter reads: "RED-SIDED MEADOW-MOUSE, back slate-coloured, belly ash-coloured, sides nearly scarlet, tail rather short; thumb of fore-foot rudimentary.— *Size*, a little greater than that of the common domestic mouse." No specimens were preserved but Surgeon Collie recorded that it "burrows in the turfy soil on the shores of Behring's Straits." The name has since been lost sight of, though Baird (1859) reprints the description, but includes it among the species of American mammals unknown to him by specimens. He even suggests that it might apply to an Evotomys, were the colors transposed in the description! The diagnosis is unmistakable, however, and describes the highly colored adult Alaskan Lemming sufficiently well. Moreover, the Evotomys is not a tundra-loving species, and is not known to occur at Bering Strait. The lower surfaces of the Alaskan Lemming are usually washed with ochraceous or pale rusty, but in some specimens these regions are whitish or "ash-coloured," as described. Richardson placed the species with Arvicola (as he used that name) on account of its short tail and vole-like appearance, as he also did the Dicrostonyx of Greenland. The rudimentary thumb that he mentions, is further characteristic of the genus. Since the description applies well to this animal and there is no other species known that "burrows in the turfy soil" of the shores of Bering Strait which it could possibly fit, the name must inevitably replace *nelsoni*.

Recent writers have regarded this as a subspecies of *D. hudsonius*, but in its tooth-pattern, coloration, and geographic distribution, it is quite distinct and is fully entitled to rank as a separate species. The possibility of intergradation with *groenlandicus*, however, is not to be overlooked, though this point cannot be settled until more and better material from the Arctic Archipelago is available. Equally uncertain is its relationship to the Old World lemmings of eastern Asia. A single specimen, A. M. N. H. 18,590, from Gichiga, on the Okhotsk Sea, is similar in color to some Alaskan summer skins, but is more ochraceous over the shoulders and back, with a yellowish appearance in contrast to the dark red of *rubricatus*. No doubt the two are closely allied and have been separated for no very long period geologically.

Specimens examined.— A total of 152 from the following localities:—

Alaska.

"Alaska," 3 (Univ. of Cal.).
Muller Bay, Alaska Pen., 1 (A. M. N. H.).
Chignik, Alaska Pen., 1 (U. S. Biol. Surv.).
Yukon River, Russian Mission, 1 (Univ. of Cal.).
Lower Yukon, 2 (U. S. N. M.).
Near St. Michael's, 1 (Univ. of Cal.).
St. Michael's, 6 (U. S. N. M.).
Sledge Island, 4 (U. S. N. M.).
Point Barrow, 6 (M. C. Z.); 5 (A. M. N. H.); 15 (U. S. Biol. Surv.); 6 (Field Mus.); 10 (U. S. N. M.).
Flaxman Island (A. M. N. H.).
Griffin Point, 52 (M. C. Z.).
Point Humphreys, 2 (M. C. Z.).
Demarcation Point, 2 (M. C. Z.).
Ft. Yukon, 2 (U. S. N. M.).
Ft. Davis, 1 (A. M. N. H.).
Herschel Island, 1 (M. C. Z.); 8 (A. M. N. H.).
Porcupine River, 200 miles above Yukon, 1 (U. S. N. M.).

Mackenzie.

Arctic Coast, 2 (M. C. Z.).
Barren Grounds, 1 (U. S. N. M.).

Peel River, 1 (A. M. N. H.).
Tuktuyektuk, Mackenzie Delta, 1 (A. M. N. H.).
Kangiannik, Mackenzie Delta, 1 (A. M. N. H.).
Liverpool Bay, Nicholson Island, 1 (A. M. N. H.).
Anderson River, north of Great Bear Lake, 1 (A. M. N. H.); 1 (U. S. N. M.); 1 (M. C. Z.).
Ft. Anderson, 2 (U. S. N. M.).
Baillie Island, 1 (M. C. Z.); 1 (A. M. N. H.).
Horton River, 1 (M. C. Z.).
Cape Bathurst, 1 (A. M. N. H.).
Franklin Bay, Langton Bay, 2 (A. M. N. H.).
Franklin Mts., 1 (A. M. N. H.).
Coronation Gulf, 2 (A. M. N. H.).

DICROSTONYX RUBRICATUS RICHARDSONI Merriam.

Richardson's Collared Lemming.

Arvicola groenlandica Richardson, Parry's Second voyage, App., 1825, p. 304 (part).
Arvicola hudsonia J. C. Ross, J. Ross's Narrative second voyage, App., 1835, p. xiii.
Georychus hudsonius Audubon & Bachman, Quad. N. Amer. 1854, **3**, p. 81, (in part), pl. 119.
Cuniculus hudsonius Coues, Proc. Acad. nat. sci., Phila., 1874, p. 196 (part).
Cuniculus torquatus Coues, Monogr. N. Amer. Rodentia. Muridae, 1877, p. 246 (part).
Dicrostonyx torquatus Miller, N. Amer. fauna, 1896, no. 12, p. 38–40 (in part).
Dicrostonyx richardsoni Merriam, Proc. Washington acad. sci., 14 March, 1900, **2**, p. 26.
Dicrostonyx hudsonius richardsoni Elliot, Field Columbian mus. publ. zoöl. ser., 1901, **2**, p. 211.

Type.— Skin and skull, adult male, $\frac{5489}{6164}$ C. H. Merriam coll., Fort Churchill, Keewatin, west coast of Hudson Bay, July, 1859. W. MacTavish.

General characters.— Adult in summer, a nearly uniform ruddy gray above, with a black median stripe from nose to tail. Skull with proportionally longer rostrum, less tapering nasals, and slightly more notched, anterior parietal border as compared with typical *rubricatus;* interparietal with anterior edge forming three points of equal height, with a notch on either side of the median projection.

Color.— *Adult in summer:* — general tone of the upper surfaces a ruddy gray, varying in intensity to a decided brownish. In detail, the sides of the nose and flanks are buff-yellow, sides of the shoulders and a band across the throat washed with clear tawny, ears tawny, nose a mixture of blackish and buffy hairs forming a dark grizzled patch which is continued as an ill-defined black median stripe to the tail; cheeks and a patch below the ear buffy gray; rest of the upper parts a uniform buffy to brownish gray due to a mixture of scattered black hairs with others having a minute black tip and a broad subterminal ring of ochraceous-buff shading into tawny in its upper half. Base of tail like the body, its tip as well as the upper sides of the feet whitish with a buffy wash. Beneath, the tips of the hairs are pale cinnamon-buff varying to nearly clear cinnamon medially on the chest in some specimens.

Adult in winter: — pure white throughout, the hairs plumbeous at their bases.

Immature and young are similar in summer coat to the adult, but lack the ruddy tones. The black dorsal stripe is darker and more clearly defined; the ear-patches are black. The upper surfaces, cheeks, and sides are a mixture of black hairs with hairs having black tips and broad subapical rings of ochraceous-buff, the latter color nearly clear on the sides of the nose and fore shoulder. A collar of the same encircles the throat; elsewhere the under surfaces are soiled whitish with a buffy wash. Upper sides of feet dusky. Fur everywhere slaty at the base.

In coloration, the adults of typical *richardsoni* show an approach to the uniformity of hue in *hudsonius*, and quite lack the brilliant and contrasting colors of Alaskan specimens of *rubricatus*. The more yellowish tone, as compared with *hudsonius*, is obvious, however, and is equally apparent in the young. Occasional adult specimens are very ruddy, due to the strong development of the tawny-colored bands on the individual hairs.

Skull.— In the original description, Dr. Merriam drew attention to the similarity in pattern between the molars of this and the Alaskan Collared Lemming, but considered them smaller and narrower. He further pointed out that the rostrum and nasals are proportionally longer, and laid particular stress on the "broadly rounded and rather depressed bullae." With a large series of both forms for comparison, the last character does not appear as striking as originally claimed, though the bullae average larger in *richardsoni* and are slightly more inflated anteriorly. The teeth in fully adult animals of the same relative age do not show appreciable differences of value. Nevertheless there are several rather striking peculiarities which hold good on the average, as differential characters between the Hudson Bay and the Alaskan specimens. In the former, the rostrum and nasals are longer, the nasals taper very little in their posterior half, but hold their breadth well, and end abruptly, either straight across, or with a slight bevel to the median line. In the Alaskan *rubricatus*, the nasals usually taper gradually in the posterior half, and though sometimes ending squarely across, are more often drawn to a median point. The anterior boundary of the parietals on the upper side of the skull is usually much more deeply notched at the midline in *richardsoni*, and the interparietal, though rather rectangular as in *rubricatus*, generally differs in having the anterior border more bracket-shaped, with the median point in the same transverse plane as the lateral points, and a shallow notch on each side (Plate **1**, fig. 7).

Measurements.— The five largest specimens (all females) obtained by Mr. E. A. Preble at the type-locality in 1900, measured as follows (all are in the collection of the U. S. Biological Survey): —

No.	*Total length.*	*Tail.*	*Hind foot.*
106,322	150	13	19
106,342	145	15	20
106,462	145	14	20
106,463	142	13	19
106,454	145	14	20
Average	145+	13+	19+

The skull of 106,322 measures: greatest length 32 mm.; basal length 29; palatal length 18; nasals, medially 9.2; zygomatic breadth 20; interorbital breadth 4.5; mastoid breadth 14.8; upper molar row (alveoli) 8.3; lower molar row (alveoli) 7.5.

Molt.— The specimens at hand are insufficient to show the precise dates of change. A few aged specimens from the northwest coast of Hudson Bay illustrate well the irregularity of this process in old animals. For, whereas in younger specimens the new hairs of the summer coat grow so rapidly that they blend with the white hairs of the winter pelage, and thus give rise to great variation in mottling with the gradual loss of the white, in old animals the growth of the new pelage is slower so that it appears as a dorsal patch of short dark fur, in sharp contrast to the tufty remnants of the long winter coat which is shed before the new coat reaches full length.

It was probably a specimen of this race on which James Clark Ross (1835) made the experiment of delaying the molt to winter pelage by keeping the Lemming in a cage in the warm cabin of the vessel during the course of explorations for the Northwest Passage. It remained in the dark coat until February, though with apparently some indications of white hairs making their appearance. After that time its cage was placed outside on the deck, where the thermometer went down as low as 30 degrees below zero, and at the end of a week the lemming was entirely white. It died of exposure shortly after.

Geographic distribution.— The type-locality of *richardsoni*, Fort Churchill, Hudson Bay, is at about the extreme southeastern point of its range. Here it shows its maximum of differentiation from typical *rubricatus* of Alaska, both in its dull ruddy-gray coat and in certain cranial characters, as previously pointed out. To the northwestward it intergrades completely with *rubricatus*, and although the specimens at present available are insufficient for an exact determination of the range-limits, they show in general the area inhabited. Like the other forms of the genus it is confined to the barren-ground areas, and the Arctic coasts. Preble (1902) found it on the barrens below Cape Churchill and farther north at two camps south of Cape Eskimo. His beautiful series of specimens, which I have studied, comprises young, immature, and adult animals, and those of the same age are very uniform in general appearance. A series from the extreme northwestern part of Hudson Bay, collected by Captain G. Comer, at Cape Fullerton, Repulse Bay, Southampton Island, Whale Point, and Frozen Stream, are apparently the same. They are, however, for the most part May or early spring specimens and those that are not white, have not fully developed the summer coat. A few, however, seem to be in nearly complete summer pelage and these average grayer than typical *richardsoni*, but seem best referred to that race, though the series is not strictly comparable with that from Fort Churchill. In cranial characters, also, there are slight discrepancies with the trend of variation toward *rubricatus* rather than typical *richardsoni*. Richardson, in 1825, described in considerable detail a specimen taken August 22 at Repulse Bay, and his description accords well with that of *richardsoni*. To the westward two specimens from Artillery Lake, in extreme eastern Mackenzie, are nearly typical *richardsoni* in color, and probably mark about the limit of the range of the subspecies in this direction. Unfortunately the skulls of both are in fragments. From still farther west, I have seen three skins from Aylmer Lake, western Keewatin, which in color are intermediate between *richardsoni* and true *rubricatus*. Their cheeks are distinctly gray, though not the clear gray of the latter, and though the body is of the general brownish gray typical of *richardsoni*, there is also a distinct indication of the chestnut shoulder area reaching from the neck nearly to the middle of the body as in *rubricatus*. Another specimen, from Coronation Gulf, directly north of Aylmer Lake, but on the Arctic Ocean, is also intermediate, but on the whole nearer *rubricatus*. From this longitude westward, all the specimens examined are more or less typical of the latter form.

Habits.— A summary of observations on the habits of this Lemming is given by Preble (1902) chiefly from his own field-notes. He found the animals inhabiting burrows mainly in gravelly ridges along the Hudson Bay coast. These burrows were usually not over two or three feet in extent, with the entrance passage at an angle of 45 degrees or so, then continuing horizontally to the nest of grass and moss. Usually a side gallery branched off near the nest and was used as a place of refuge. Preble found no other food in the burrows than remains of the leaves of Bearberry (Arctostaphylos). The breeding season seemed to be nearly over at Ft. Churchill by mid-August. Three young was the usual number in a litter, and every pregnant female secured contained but three embryos. That two litters are, in at least some cases, brought forth in the short Arctic summer, is shown by the fact that one "captured on the Barren Grounds August 12, besides containing the usual three small embryos, was suckling three young." As previously shown, the Alaskan Collared Lemming averages more (seven) to the litter and may have as many as eleven young.

Remarks.— The Collared Lemming of the west side of Hudson Bay is a very strongly marked subspecies and though closely related to the Alaskan *rubricatus* with which it intergrades to the northwestward, it parallels *hudsonius* of Labrador in its dull uniform coloration, though it is not so gray as the latter. Specimens were obtained from the northwest part of Hudson Bay during Parry's Second voyage, and described by Richardson as *Arvicola groenlandica*. Audubon and Bachman, in referring to the Labrador species, distinctly state that they had seen no specimens of that animal, but Audubon figures a specimen which he saw at the British Museum, that may have been the one recorded by Gray (1848) just before, as having been sent by

Rae from the west side of Hudson Bay. At all events, his figure shows the even ruddy tint of *richardsoni*. Dr. Merriam, in 1900, first recognized the form as distinct, but as his type was in white pelage, he was able to point out certain cranial differences only, in comparison with other American specimens. Preble, in 1902, amplified his descriptions and gave some account of the habits. By more recent writers this has been grouped with *hudsonius* as a subspecies, but a study of the series now available proves its relationship rather with the Alaskan *rubricatus*, as originally pointed out by Dr. Merriam.

Specimens examined.— In all 112, from the following localities:—

Ft. Churchill (type-locality), 34 (U. S. Biol. Surv.); 1 (U. S. N. M.).
Cape Churchill, 15 (U. S. Biol. Surv.).
50 miles south of Cape Eskimo, 10 (U. S. Biol. Surv.).
25 miles south of Cape Eskimo, 5 (U. S. Biol. Surv.).
Chesterfield Inlet, 2 (A. M. N. H.).
Baker Lake, 1 (A. M. N. H.).
Cape Fullerton, 4 (A. M. N. H.).
Wager River, 1 (A. M. N. H.).
Repulse Bay, 3 (A. M. N. H.).
Southampton Island, 2 (A. M. N. H.).
Frozen Stream, 1 (A. M. N. H.).
Cape Sheridan, 12 (A. M. N. H.).
Winter Island, 1 (A. M. N. H.).
Whale Point, 2 (A. M. N. H.).
Northwest coast of Hudson Bay, 13 (A. M. N. H.).
Artillery Lake, 2 (A. M. N. H.).
Aylmer Lake, 2 (A. M. N. H.); 1 (U. S. Biol. Surv.).

DICROSTONYX RUBRICATUS UNALASCENSIS Merriam.

Unalaska Collared Lemming.

Dicrostonyx unalascensis Merriam, Proc. Washington acad. sci., 14 March, 1900, **2**, p. 25.

Dicrostonyx hudsonius unalascensis Elliot, Field Columbian mus. publ. Zoöl. ser., 1901, **2**, p. 210.

Type.— A skull lacking the occipital portion, U. S. Biological Survey 99,622 U. S. N. M., Unalaska Island, Alaska, 8 July, 1899. C. Hart Merriam. Found in owl pellet.

General characters.— Closely related to *rubricatus* from which it differs in its relatively longer and more slender rostrum, its weaker, less broadly rounded zygomata, and slightly more protruding incisors. External characters unknown.

Measurements.— The type-skull has the following dimensions:— palatal length 18.8 mm.; diastema 10.9; nasals in median line 9.2; zygomatic breadth 21.3; interorbital breadth 4.6; upper molar row (alveoli) 8.

Geographic distribution.— Confined, so far as known, to the island of Unalaska, Alaska Peninsula.

Remarks.— This Lemming is still unknown except from skulls. In his original description, Dr. Merriam contrasts its cranial and dental characters with those of the very different *hudsonius* only, and makes no comparison with the form from the mainland of Alaska, to which it is closely related. The only truly diagnostic character given is that of the rounded zygomata, which in the type-skull and one other younger skull, are appreciably less heavy and less squarely bowed, as compared with skulls of *rubricatus* of approximately the same age. The squamosal portion of the arch is noticeably more slender and without the slight angular projection at the posterior edge. In addition, both these skulls have a decidedly longer and more slender rostrum, with somewhat more protruding incisors. In view of these apparent differences, the Unalaska Lemming may be considered distinct for the present. More specimens from the Alaska Peninsula may show complete intergradation since the adjacent islands are not separated by distances greater than a lemming might occasionally traverse. The only lemmings I have seen from the Alaska Peninsula are one from Chignik and one from Muller Bay, both too young be of much value in this connection. Possibly color-differences may be found.

Since the above was written, I have had for examination twenty-five additional skulls of adult Lemmings lately obtained by the U. S. Biological Survey from Unalaska. All were taken from owl-pellets. This fine series amply bears out the cranial differences previously mentioned as distinguishing this race from typical *rubricatus*. The longer rostrum, more proclivous incisors, and weaker, more rounded zygomata prove to be uniformly characteristic.

Of Dr. Merriam's original specimens, there were but four skulls, taken from owl-pellets. None was numbered, and three of them are badly broken, but the fourth has been taken as the actual type and was so labeled later.

Specimens examined.— Twenty-seven skulls from Unalaska, viz., the type and 25 others in the U. S. Biological Survey collection, and a nearly perfect skull in the U. S. N. M.

DICROSTONYX EXSUL, sp. nov.

St. Lawrence Island Lemming.

Cuniculatus torquatus Nelson, Rept. nat. hist. collections in Alaska, 1887, p. 278 (part).

Type.— Skin and skull. Adult ♂, M. C. Z. 11,885, St. Lawrence Island, Bering Sea, 24 June, 1913. Joseph Dixon.

General characters.— Similar to *rubricatus* but coloring much less intense, more grayish throughout. Skull with more abruptly narrowed nasals, their proximal ends bevelled sharply to a median point instead of tapering gradually; interparietal more nearly square in general outline.

Color.— The type has nearly clear gray cheeks, but slightly mixed with black hairs; nose and area between the eyes gray, much darkened by black hairs; indistinct blackish median line on the back, not clear black as in *rubricatus;* ear-patch a mixture of ochraceous-buff and tawny; rest of the upper parts a general pinkish gray, blacker on the rump, due to a slight admixture of black hairs with others having concealed slaty bases, a broad whitish subterminal band, and a ferruginous tip. At the sides of the body the black hairs are wanting, and the whitish ring of the other sort of hairs is broader and clearer, the colored tip longer and yellower, nearly orange-buff, most intense at the shoulders. Chin and under sides of fore legs clear white, throat heavily washed with tawny, which blends into the ochraceous-buff wash of the rest of the under parts. Tail whitish; feet pale buff above in their central portion, whitish with a dusky tinge peripherally.

Skull.— The skull is very similar to that of *D. rubricatus* of the Alaskan mainland, but the nasals are more abruptly narrowed at about their distal two thirds; thence they taper slightly toward the proximal end, where each is bevelled at an angle of about 45 degrees, to a median point. In *rubricatus* the taper is much more gradual from anterior to posterior end, and the bases are usually but slightly or not bevelled. The interparietal, in the specimens examined, is more nearly square, hence of less transverse width than in *rubricatus* (Plate, **1**, fig. 9). The teeth show no important differences.

Measurements.— The type measured in the flesh as follows:— total length 146 mm.; tail 17; hind foot 20.

The skull of the type lacks the occipital portion; it measures:— tip of nasals to posterior border of interparietal 28.5 mm.; nasals 9.1; palatal length 18; diastema 10.2; zygomatic width 20; interorbital width 4.5; upper molar row (alveoli) 8; lower molar row (alveoli) 7.9.

Geographic distribution.— This insular species is confined to St. Lawrence Island, where like the large *Microtus innuitus*, it seems to have become differentiated through isolation.

Remarks.— This is a very gray, bleached-appearing species compared with the Alaskan *rubricatus*. But four specimens were taken by Mr. Dixon during his brief stay at St. Lawrence Island. One of these was a subadult female, containing four embryos, June 24th. Two other specimens of about the same age agree with this last in having a somewhat browner tint to the back than the type, an older animal. Nelson, as long ago as 1887, recorded the lemming as common on this and the Bering Strait Islands.

Specimens examined.— Four from St. Lawrence Island (M. C. Z.).

DICROSTONYX GROENLANDICUS (Traill).

Greenland Collared Lemming.

Mus groenlandicus Traill, Scoresby's Journ. voyage northern whale-fishery, 1823, p. 416.

Lemmus hudsonius Sabine, Parry's voyage. Suppl. to app., 1824, p. clxxxviii (= 188).

Lemnus (sic) *groenlandicus* Schinz, Synopsis Mamm., 1845, **2**, p. 256.

Hypudaeus groenlandicus Reinhardt, Rink's Grφnl. geogr. stat. beskriv., 1857, p. 8.

Myodes torquatus var. *grφnlandicus* Brown, Proc. Zoöl. soc. London, 1868, p. 350.

Myodes gröenlandicus Wagner, Schreber's Säugethiere. Suppl., 1843, **3**, p. 606.

Myòdes torquatus Feilden, Zoölogist, 1877, ser. 3, **1**, p. 320.

Cuniculus torquatus Greely, Three years of Arctic service, 1886, **2**, p. 363 (part).

Dicrostonyx torquatus Miller, N. Amer. fauna, 1896, no. 12, p. 38–40 (part).

Dicrostonyx hudsonius Elliot, Field Columbian mus. publ. Zoöl. ser., 1901, **2**, p. 209 (not *Mus hudsonius* Pallas, 1778).

Dicrostonyx hudsonius groenlandicus Jacobi, Abh. u. ber. K. zool. anthrop.-ethnogr. mus. Dresden, 1911, **12**, no. 4, p. 8.

Type.— A skin, collected July 26 or 27, 1822, by William Scoresby, in Jameson's Land, east coast of Greenland, about lat. 71° N. According to Brown the specimen was in the Edinburgh Museum of Science and Art, where he examined it in 1868.

General characters. — Above, in summer, a mixture of blackish and gray, with a wash of ochraceous over the fore shoulders, sides, and belly; a black median stripe from nose to shoulders. Tooth-pattern differs from that of other American species in the reduction of the small postero-internal enamel-fold on the first and second upper cheek-teeth to a mere point so that it is practically absent, yet the posterior border of the last internal closed triangle is strongly concave in each tooth. From the *rubricatus* group it differs in lacking the small antero-external enamel-fold on the last lower molar, though that on the inner side is present.

Color.— *Summer pelage:* — dorsal surfaces, nose, and cheeks, a general grizzled gray, due to the mixture of hairs having nearly the middle third white, succeeded by a very narrow ochraceous ring and a black tip. On the neck and shoulders, the ochraceous rings are broader, and on the ears, sides, and at the root of the tail occupy the entire tip of the individual hairs, excluding the black. The general effect is of an ochraceous-orange wash at the shoulders, slightly redder and more mixed with black dorsally. A narrow black median stripe runs from the forehead to the shoulders. Upper surfaces of feet and the tail silky white with a slight buffy tinge. Under surfaces washed with ochraceous-orange; soles of fore feet and the wrists white. The concealed bases of the hairs are slate color.

Winter pelage: — pure white throughout, the bases of the hairs slate color.

Skull.— Compared with specimens of approximately the same age, the skull is smaller than that of *D. rubricatus* from northern Alaska, the zygomata are less roundly bowed, and the interparietal instead of being nearly rectangular with a slight anterior median projection is more distinctly pentagonal, with the short lateral boundaries reduced, and the two anterior sides meeting at a considerable angle (Plate 1, fig. 10).

The teeth, like the skull, are weaker and narrower, and the minute postero-internal fold of enamel of the two anterior upper cheek-teeth is proportionately more reduced, until it is a mere point. In the few specimens examined the small additional antero-external enamel fold of the last lower molar (usually present in the *rubricatus* group) is lacking.

Measurements. The collector's measurements of two skins from Ellesmere Land, are (reduced to millimeters):— total length 106, 107; tail 9.5, 8; hind foot 16, 14. The skull measures (M. C. Z. 10,733); basal length 27.5; palatal length 17; zygomatic breadth 19; mastoid breadth 14.1; nasals 9; upper tooth-row (alveoli) 7.5; lower tooth-row, alveoli 6.5.

Molt.— In northeast Greenland, Manniche (1910) found that the hair changes toward the end of May, or in some specimens, a trifle earlier. The two specimens from Bache Peninsula, Ellesmere Land, in the collection of the M. C. Z. show variation in the assumption of the summer pelage. The older specimen, taken June 14th, has the full summer coat, whereas the younger one (taken June 15th) is less advanced, and although it has shed the white winter coat, it retains the enlarged fore claws, and its back is in the gray stage, where the short new fur has not yet fully grown out. A very faint dark median line is present. On the sides of the body the new fur has come in to nearly its full length and the reddish collar appears at the fore shoulders. An adult from Cape Mercy, Baffin Land, 20 May, 1878, is in a peculiar condition of change. On the forehead and shoulders new buff-tipped hairs are coming in over an oval area, and along the sides the bright tinge of rusty is well developed, passing into gray on the hips, while the old white fur of winter is retained conspicuously between these two areas. The white winter pelage is assumed in late September, before the snows come on.

Geographic distribution.— The Greenland Collared Lemming is found from about latitude 69° N. on the east coast of Greenland, northward to the limit of land, 83° 24′, and thence westward along the coast of North Greenland to the Kane Basin, and across the Robeson Channel to Grinnell Land, Ellesmere Land, and south to Baffin Land. Jameson Land, (N. lat. 71°) where Scoresby obtained the original specimen, is near the southward limit of its range in East Greenland, but more recently, Jensen, in 1900, collected specimens still farther south at Cape Dahon (about N. lat. 69°). From this point northward along the coast, it is common and has been traced northeastward to Lambert's Land and beyond to 83° 10′ N., where Koch and Bertelsen, of the Danish Expedition 1906–1908, discovered its presence at the close of their survey of this last link in the outline of Greenland's north coast. Greely (1886) had previously reported its discovery by Lockwood in May, 1882, at various points from Mary Murray Island in 83° 19′ N. lat., to Lockwood Island, 83° 24′ N. It is unlikely that it occurs far inland from the coast at any point, though Manniche records that Wegener and Weinschenck of the Danish Expedition found traces of lemmings "in Dronning Louises Land, 40 kilometers out on the inland ice" (N. lat. 75°). Southward of the Kane Basin in northwest Greenland, this Lemming seems to be unknown, and Feilden (1877) supposes that its range is effectively barred by the great Humboldt Glacier that debouches into the sea at this point. No trace of it has been found in west Greenland, and its presence, did it exist there, would surely be known to the many Eskimo, missionaries, and other travellers to these more frequented portions of the country. What barrier prevents its further spread in southeastern Greenland, is still unrecognized. Across the Robeson Channel and along the western shores of Smith Sound in Grinnell Land and Ellesmere Land it is common and probably ranges throughout much of this large land-mass. In general, therefore, its distribution is nearly coextensive with that of the White-fronted Musk ox (*Ovibos wardi*). Feilden (1877) speaks of its habit of frequently wandering for long distances over the ice, and his party several times found lemmings on the floes of Robeson Channel, sometimes at considerable distances from land, and often in a very exhausted condition, if not actually dead. The limits of its range to the south and west are yet to be ascertained.

A single specimen (U. S. N. M. 12,986) was obtained by Ludwig Kumlien in May, 1878, from near Cape Mercy, Cumberland Peninsula, Baffin Land, which seems to be unquestionably the Greenland Lemming. It is in process of molt, but shows the rusty sides and gray hips, and the skull is typical in its tooth-characters. Kumlien (1879, p. 53) found no traces of it elsewhere on Cumberland Sound, though it was said to have been common there formerly. This is the most southern record on the west side of Baffin's Bay.

The species is the most boreal of the true rodents, and extends its range farther toward the pole than any other of its genus.

Habits.— The reports of Arctic explorers make frequent mention of this Lemming, but usually in a rather casual way. Manniche (1910) has lately written a most interesting and valuable summary of his own studies during two years spent in northeast Greenland. His experience and that of others, is that the animal is found in favorable localities along the coast, where Arctic vegetation is in comparative abundance, particularly grasses, on which it largely feeds, and the *Saxifraga oppositifolia.*

Little is known of the breeding habits. Large nests of dried grasses and hair or wool of other mammals (musk ox) if available, are made.

The Polaris expedition discovered a nest with four young on August 11th, at Thank God Harbor (Robeson Channel), but no doubt this is a late date. Feilden found nests in June and July, containing from three to five young, somewhat fewer than the average for *rubricatus*. In summer they live largely in underground runways, but in winter these are extended beneath the snow, on the ground.

The varying abundance of lemmings is one of their most interesting peculiarities. In a succession of favorable seasons they seem to increase greatly and spread into less thickly populated areas. But in adverse years they become reduced nearly to the point of extinction. From his observations in northeast Greenland, Manniche concluded that the lemmings were greatly dependent for safe wintering upon a sufficient blanket of snow (a meter or more) beneath which they might live in comparative security from the extreme cold of the long winter. He found that a winter which commenced with violent winds, preventing an even snow-fall, was very unfavorable. For the grass-grown areas were swept bare of snow, and the lemmings, unable to obtain food with shelter, become exterminated in large numbers. Their natural enemies likewise contribute to their destruction. The Arctic Weasel pursues them in their burrows throughout the year, and at other seasons than winter the Arctic Fox, the White Wolf, Snowy Owl, Glaucous Gull, and Long-tailed Jaeger feed largely on them.

Manniche asserts that during the long Arctic nights the lemmings do not come to the surface of the snow, but with the approach of spring are often seen above ground, and even make long journeys over the snow, or across the ice to outlying islands. Similar observations have been reported by other explorers.

Remarks.— Until more exact comparisons with Old World specimens can be made, it is unwise to venture an opinion as to the probable relationship of the Greenland Lemming. It seems in some respects like a depauperate form of *D. rubricatus* of northwestern America. Its geographic distribution in Greenland may indicate that its arrival there is geologically recent, for it seems to have reached only the north and east coasts of that country, and has not yet spread to the south and west coasts. These facts may point to its origin from the west. Specimens from the Arctic Archipelago are much desired to establish whether or not complete intergradation takes place with American continental forms. Present evidence of this, however, is wanting, and the dental and color-characters seem sufficient to accord specific rank to this Lemming. It is certainly not closely related to the

Labrador animal (*D. hudsonius*). The short median black line, reaching the shoulders in adults, the grayer tint of the summer pelage, the reduction of the postero-internal enamel fold of the anterior two upper teeth and the absence of the antero-external fold in the last lower molar, separate it sharply from the continental forms of *rubricatus*. Should intergradation be demonstrated, however, *rubricatus* and its various forms here recognized, would stand as subspecies of *groenlandicus*.

Specimens examined.— Four, as follows:— Greenland, Smith Sound, 1, skull only (U. S. N. M.). Ellesmere Land, Bache Peninsula, 2 (M. C. Z.). Baffin Land, Cape Mercy, 1 (U. S. N. M.).

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EXPLANATION OF THE PLATE.

EXPLANATION OF PLATE.

Fig. 1–3.— Crown views of the two anterior cheek-teeth of the left side. × 10.7. (In these ventral views, the lingual side is at the left hand, the external side at the right).

Fig. 1.— *Dicrostonyx hudsonius,* M. C. Z. 8,671.

Fig. 2.— *D. rubricatus,* M. C. Z. 11,835.

Fig. 3.— *D. groenlandicus,* M. C. Z. 10,733.

Fig. 6.— Crown view of last lower molar of *D. hudsonius,* M. C. Z. 4,167, right-hand side. × 10.7.

Fig. 8.— Crown view of last lower molar of *D. rubricatus,* M. C. Z. 11,834, right-hand side. × 10.7.

Fig. 4, 5, 7, 9, 10.— Outlines of the interparietal and adjacent portion of parietals and squamosals. × 5.9.

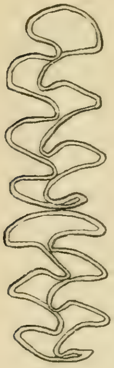
Fig. 4.— *D. hudsonius,* showing squamosals abutting against the interparietal, U. S. N. M. 190,377.

Fig. 5.— *D. rubricatus,* with a prolongation of the parietals separating the squamosals and interparietal, M. C. Z. 11,850.

Fig. 7.— *D. richardsoni,* interparietal broad with a bracket-shaped anterior outline, U. S. Biol. Surv. 106,342.

Fig. 9.— *D. exsul,* interparietal squarish, M. C. Z. 11,885.

Fig. 10.— *D. groenlandicus,* interparietal somewhat lozenge-shaped, M. C. Z. 10,733.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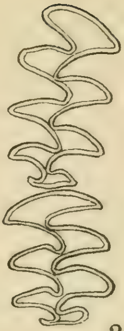
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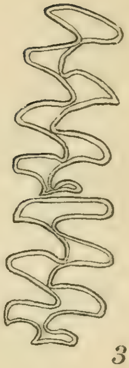
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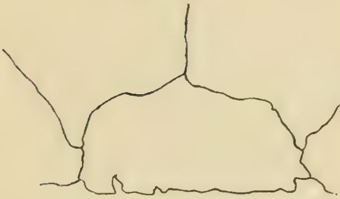
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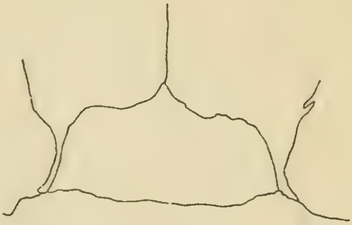
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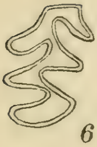
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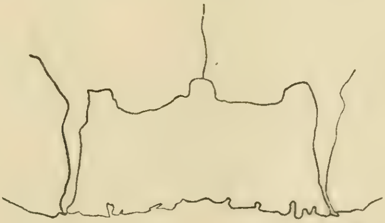
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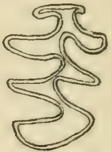
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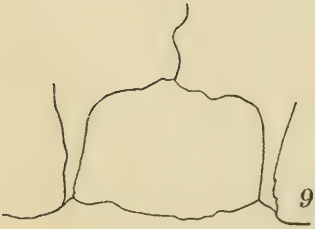
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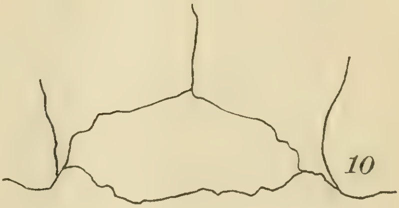
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Bulletin of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. LXII. No. 14.

NOTES ON THE AVIFAUNA OF NEWFOUNDLAND.

By G. K. Noble.

CAMBRIDGE, MASS., U. S. A.:
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March, 1919.

No. 14.— *Notes on the Avifauna of Newfoundland.*

By G. K. Noble.

In the summer of 1915, through the kindness of Mr. John E. Thayer, the Museum of Comparative Zoölogy was able to send the writer to Newfoundland to study and collect birds.

Several races of birds had previously been described from this region by a number of different investigators, and it was desired to round out the collections of the Museum with a large series of Newfoundland birds.

The Newfoundland Fish and Game Commission extended many courtesies to aid in the collecting. Although a recent ruling by the Board of Commissioners limited the number of birds taken for scientific purposes to six specimens of a species, still the Board granted the Museum of Comparative Zoölogy the privilege of taking: —

1. Two or three additional specimens of each species, these to be given later to the Museum at St. John's.
2. Twelve specimens of a few especially interesting species in addition to those collected for the local Museum.
3. Fifty specimens of thrushes (including the four species) with a few additional specimens for the Museum at St. John's.

These special privileges have enabled me to determine to a certain extent the range of variation in the more questionable species. After a short study, it became at once evident that Newfoundland was a region in which the differentiation of dark colored races was beginning to take place. In the case of certain species, this differentiation has reached the point where well-defined races can be described, but in the case of most species there is only a tendency toward a darkening. Variation curves drawn for mainland and Newfoundland specimens overlap to a greater or less extent. With the limited series of Newfoundland birds available for study, it does not seem advisable to describe any new races, but it is probable that one or possibly two of the birds mentioned below may yet be shown to be distinct from their mainland relatives.

Newfoundland is a region of especial interest to a student of zoögeography, for, as has been pointed out by a keen student of phytogeography, Prof. M. L. Fernald of Harvard University, Newfoundland possesses a very complex flora. This flora, according to Fernald (1911), contains representatives of four distinct centers of dispersal: —

1. Boreal types, which gained access to Newfoundland probably somewhere from the north.
2. Western or Canadian types not included in the above, many of these being species which, although not found today in any of the country east of the Canadian Rockies, appear again in Newfoundland.
3. Southwestern types, representing the remnant of a coastal plain flora which flourished on an off-shore barrier beach or chain of islands extending along the edge of the continental shelf.
4. Endemic plants or species unknown on the American continent, but finding their nearest relatives in identical or related species of the Irish or neighboring coasts.

Bangs (1913, p. 509, 510) has shown that the evidence afforded by the mammalian life of Newfoundland bears out the existence of at least two of these centers of dispersal, viz.— a boreal center to the north and coastal plain center to the south. In view of the fact that many of the typical Labrador mammals, viz.— Moose, Marmot, Porcupine, Squirrels, certain Mice, Shrews, etc., are absent from Newfoundland, it would appear that this region has not been recently connected with the mainland. The mammalian life of Newfoundland consists of a flux of two elements: — a southern coastal plain fauna, represented by the Vole, Muskrat, etc., and a northern tundra fauna, represented by the Caribou, Hare, etc.

An analysis of the bird fauna lends some support to the views outlined above, but there is no evidence among any of the vertebrates of the existence of an Atlantic landbridge between Newfoundland and the Irish coast. Most of the evidence afforded by the birds is of a negative nature, and yet the absence in Newfoundland of many typical Labrador birds strangely suggests a barrier between Newfoundland and the mainland. The nature of this barrier is well expressed by Fernald (1918, p. 238): —

"In explaining [1] the migration to Newfoundland of a large element from the Atlantic coastal plain of the United States it has been necessary to reconstruct the Tertiary continental shelf, which is now depressed as a shallow bench off the east Atlantic coast of America; and from the botanical and zoölogical evidence, as well as from recently published geological evidence,[2] it now seems perfectly settled that the continental shelf formed in the late Pleistocene and even later a nearly continuous although somewhat interrupted floor from New Jersey and southern New England, by way of Sable Island and the Grand Banks, to southern and eastern Newfoundland. And upon this floor the southern flora and fauna migrated to Newfoundland; but the unfavorable conditions of a sand-floor with meager forest and coastal plain bogs and barrens proved unattractive to the life of our rich Canadian forest, with the result that the forest species both of animals and plants, or the species which demand rich or basic soils, were for the most part unable to cross to Newfoundland."

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[1] Rhodora, **13**, 135–162, 1911.

[2] Barrell, Amer. journ. sci. ser. 4, **40**, 1–22, 1915.

The following tables of species of birds are intended to show the probable affinities between the Newfoundland and mainland avifaunas. It is to be noted that in order to bear out the hypothesis of a former barrier beach fauna, more weight must be placed on the negative than positive evidence. Newfoundland avifauna is more peculiar in the birds lacking than in those present.

1. Birds indigenous or otherwise, present in Newfoundland, but absent from Labrador.

1. *Having southern affinities.*

1. Mourning Warbler.
2. Black and White Warbler.
3. Yellow-bellied Sapsucker.
4. Acadian Chickadee.
5. Newfoundland Oven-bird.
6. Newfoundland Yellow Warbler.

2. *Having northern affinities.*

1. Allen's Ptarmigan.
2. Welch's Ptarmigan.
3. Newfoundland Hairy Woodpecker.
4. Newfoundland Jay.
5. Newfoundland Pine Grosbeak.

3. *Having western affinities.*

1. Willow Thrush.
2. Newfoundland Crossbill.

2. Birds absent from Newfoundland but occurring in Labrador, excluding wide ranging transients and those species represented in Newfoundland by geographic races.

1. Canadian Ruffed Grouse.
2. Spruce Partridge.

3. Sharp-tailed Grouse.
4. Cooper's Hawk.
5. Red-tailed Hawk.
6. Duck Hawk.
7. Black-billed Cuckoo.
8. Ruby-throated Hummingbird.
9. Phoebe.
10. Alder Flycatcher.
11. Hoary Redpoll.
12. Lapland Longspur.
13. Northern Shrike.
14. Nashville Warbler.
15. Tennessee Warbler.
16. Bay-breasted Warbler
17. Blackburnian Warbler.
18. Pine Warbler.
19. Canadian Warbler.
20. Black-throated Blue Warbler.

3. Birds rare in Labrador but fairly common in Newfoundland.

1. Black-capped Chickadee.
2. Olive-sided Flycatcher.
3. Black-throated Green Warbler.
4. Great Horned Owl.
5. Redstart.
6. Winter Wren.

A feature of as much interest as the gaps in the list of species is the large number of geographic forms recognized, eight in this paper. But there are at least twice as many species in Newfoundland which show a tendency toward darkness. Here, in Newfoundland, one can observe bird-races in the making! It is impossible to say whether this darkening of the coloration is an acquired character induced by the humidity and bleakness of the country, or whether the environment is one which fosters all variations towards darkness, which variations may themselves have arisen independent of the environment. No matter where the truth lies, these tendencies exist, and in these Newfoundland birds, we have represented the very beginning of future geographic forms.

In the preparation of the following notes, I have received the ever generous aid of Mr. Outram Bangs. Mr. William Brewster has loaned specimens for study. Information in regard to the Labrador birds was obtained from the published works of Drs. C. W. Townsend, G. M. Allen, Mr. A. C. Bent and others, but chiefly from Townsend's and Allen's paper on the Birds of Labrador, (1907).

Annotated List of Species collected.

1. GAVIA IMMER (Brünnich).

Loon.

One adult female from Nicholsville, July 22nd.

The Loon breeds commonly in Newfoundland. Old birds accompanied by young were observed along the Upper Humber from July 9th to 22nd. In the Hobley Hills on July 27th, one young bird was observed with two adults in a small pond, not over a hundred yards in length. Since the young bird was still in the down, the parents must have bred in this very small pond.

2. PUFFINIS GRAVIS (O'Reilly).

Greater Shearwater.

One adult female taken by a fisherman on the Grand Banks early in June.

This bird is without doubt very common off the coast, but I did not have the opportunity of observing any alive.

3. MERGUS SERRATOR Linné.

Red-breasted Merganser.

Two adult females, Nicholsville, July 16th and 17th; three small chicks, one male, and two females, taken near the same place July 8th and 9th, and one large chick from Nicholsville, July 20th.

Red-breasted Mergansers were seen on the Upper Humber July 8th and 9th, and again nearly every day from July 14th to 21st. The old birds were generally accompanied by one or more chicks. On the approach of my canoe, the young birds would dive while the parents would flap away clumsily over the water.

4. CLANGULA CLANGULA AMERICANA Bonaparte.

American Golden Eye.

One adult female and two of her chicks, a male and a female (sex questioned) taken on Deer Lake, July 3rd.

Two females, each accompanied by from five to seven chicks, were seen on Deer Lake on several occasions during the first week in July. A third brood was observed on the Humber July 5th.

5. GALLINAGO DELICATA (Ord).

Wilson's Snipe.

Two adult males, and two adult females, all breeding birds taken near Nicholsville, July 5th, 7th, 10th, and 15th respectively.

During the month of July, Wilson's Snipe was found abundantly in all suitable, grassy bogs along the Upper Humber.

At Nicholsville, on gray mornings, so frequent in Newfoundland, but more especially in the early twilight, several birds could be heard winnowing at one time.

On July 7th, a brooding bird was flushed from a nest containing a complement of three eggs, but the guide accidentally stepped on the eggs before they could be secured.

6. LAGOPUS LAGOPUS ALLENI Stejneger.

Allen's Ptarmigan.

One adult male and two chicks from the Hobley Hills, July 26th and 27th; one pair of adults from the Lewis Hills, August 17th.

When Allen's and Welch's Ptarmigan occur in the same region, their ranges do not overlap but interdigitate. Both species occur on the Lewis Hills, and yet all of the Welch's Ptarmigan observed were found on the bare syenite ridges at a high altitude, while the Allen's Ptarmigans were observed lower down on the sedge-covered hillsides. No Welch's Ptarmigans were seen in the interior. It seems very probable that Allen's Ptarmigan entirely replaces Welch's Ptarmigan in the interior of Newfoundland.

7. Lagopus rupestris welchi Brewster.

Welch's Ptarmigan.

Two pairs of adults from the Lewis Hills, August 19th and 24th; three young specimens with nearly adult plumage, from the same locality, August 19th and 21st.

Brewster (1885, p. 195) in his original description of this species states: —

> "According to Mr. Welch, these Ptarmigan are numerous in Newfoundland, where they are strictly confined to the bleak sides and summits of rocky hills and mountains in the interior. Unlike the Willow Grouse of that island,* * * the Rock Ptarmigan are very local, and for the most part spend their lives on or near the hills where they are reared."

But according to Mr. Hersey's unpublished observations of 1913, and my own made two years later, the Rock Ptarmigan is found today only among the high ridges of the west coast. It seems to me that Arnold's record (Auk, 1912, **29**, p. 76) must be considered an error. Arnold states: —

> "In a dry place in a large area of spruce bog, and at one of the highest points reached by the railway, we flushed a bird of this species off her nine fresh eggs on June 6."

Welch's Ptarmigan has hitherto never been observed in a wooded area during the summer months, nor have any of the various naturalists who in recent years have been along the railway between Deer Lake and Gaff-topsails, met with this bird. On the other hand, although Allen's Ptarmigan is exceedingly abundant on these barrens Arnold does not include it in his list of birds observed. I am therefore inclined to believe that the bird Arnold observed was really this latter species.

All of the Welch's Ptarmigan observed were found on the very highest ranges of the Lewis Hills. These are composed mostly of syenite, very much weathered and fragmented. The Ptarmigan apparently feed upon the berries and grasses which form a part of the turf on these hills. All of the crops examined were stuffed with mountain bearberries *Arctostaphylos alpina* (Linné), and contained no insect food.

Welch's Ptarmigan apparently seeks refuge among the broken syenite blocks. The birds upon being flushed never scaled down into the valley below, as is the custom of Willow Ptarmigan, but flew rapidly to another mass of weathered boulders and there soon hid themselves.

On August 24th, during a heavy rainstorm, while making my way across one of these fields of grotesquely shaped stones, I came suddenly upon a old male bird. It had just emerged from between two great blocks, and stood looking at me. After a few moments hesitation, it stretched out its neck and gave a long cackle, unlike any call I had ever heard. It was a crescendo of clucks, somewhat pheasant-like in quality — *kuk, kuk, kuk, kuk* — each syllable stronger and of a higher pitch than the last.

8. ASTUR GENTILIS ATRICAPILLUS Wilson.

Goshawk.

One adult female taken at Nicholsville during March, and preserved in the flesh until June; a pair of large immature birds from Nicholsville July 29th and August 2nd respectively.

On July 6th, my guide, Norman Nichols, showed me a nest which he claimed had been occupied by Goshawks only a few weeks before. It was a bulky structure in a spruce tree about twenty feet from the ground. It was built of sticks arranged in a nearly level platform about one yard across and fifteen inches deep. I both heard and saw Goshawks in the vicinity on several later occasions. Their cry was a monotonous, but almost startling repetition of a sharp note, sounding not unlike the shrill pronunciation of the words gray, gray, gray!

9. FALCO COLUMBARIUS COLUMBARIUS Linné.

Pigeon Hawk.

Two adult females and a male from Port au Port, August 11th. I expected to find the Pigeon Hawk a common bird in Newfoundland, but aside from the specimens secured, I met with the species only at Deer Lake June 30th, and Spruce Brook September 13th.

10. BUBO VIRGINIANUS HETEROCNEMIS (Oberholser).

Labrador Horned Owl.

Four adults of both sexes from Nicholsville, July 10th, 16th, and 30th, respectively; two immature birds July 10th and August 6th from the same locality; four unsexed adults taken at Glenwood by E. Gillingham and others in January, 1913.

I have compared this series, perhaps the largest series of Newfoundland Horned Owls ever brought together, with the type (M. C. Z. 4,445) of *B. v. heterocnemis* (Oberholser) from Lance au Loup, Labrador, and have not found any constant difference with which to separate the Newfoundland bird. The differences claimed by Oberholser (1914, p. 46) are not constant in the series. The dorsal and ventral coloration, as well as the size of the type, can be matched exactly in the birds of our series. The type specimen has, however, slightly darker bands on the feet than any of our specimens. Still there is such an extraordinary variation in our eight adult specimens, that I cannot regard this as a constant difference. *B. v. neochorus* Oberholser must be considered synonymous with *B. v. heterocnemis*.

Newfoundland Horned Owls breed regularly in the dense forests along the Upper Humber. The crops examined contained only one article of food, the Varying Hare.

11. SURNIA ULULA CAPAROCH (Müller).

Hawk Owl.

One adult female taken at Nicholsville, July 14th.

The Hawk Owl is apparently not common in Newfoundland. None of my guides were familiar with it, although they all knew the Horned Owl.

12. STREPTACERYLE ALCYON ALCYON (Linné).

Belted Kingfisher.

One adult male and one adult female, Nicholsville, July 16th and 31st.

As with many of the other Newfoundland birds, the Kingfisher is slightly darker than New England specimens. Not only does the general tone above average darker, but the dark streaking of the wings is of a deeper tone.

Several Kingfisher burrows were observed along the Upper Humber. The bird breeds commonly along many Newfoundland rivers.

13. DRYOBATES VILLOSUS TERRAENOVAE Batchelder.

Newfoundland Hairy Woodpecker.

Nine adults and five young of both sexes from Nicholsville, Deer Lake, and the Hobley Hills, June 30th to July 31st.

In the regions traversed, the Hairy Woodpecker was found to be not so common as the Downy Woodpecker. It seems to prefer the big trees which have now been cut away from the river banks. In the stands of big timber between Deer Lake and the Hobley Hills, it was apparently breeding, but no young or eggs were secured.

14. DRYOBATES PUBESCENS MEDIANUS (Swainson).

Downy Woodpecker.

Ten adults and four immature of both sexes from Nicholsville, Deer Lake, Hobley Hills, and Port-au-Port.

This series of Newfoundland birds shows a considerable range of variation. The white wing-spots vary greatly in size. The ventral surface may be more or less smoky, but this feature appears to be due to dirt. Breeding birds are the most heavily stained. The differences pointed out by Oberholser (1914, p. 43) for distinguishing a Newfoundland race, *D. p. microleucus*, are not at all apparent. It seems to me that these differences are at best only a tendency, and not worthy of subspecific distinction.

15. PICOIDES ARCTICUS (Swainson).

Arctic Three-toed Woodpecker.

Three adult males from the Hobley Hills and Nicholsville, latter part of July; three immature specimens of both sexes from Nicholsville, July 16th and August 5th.

No birds of this species were seen anywhere in the rich limestone areas of the southwest. The bird evidently prefers the more truly boreal parts of Newfoundland.

16. SPHYRAPICUS VARIUS VARIUS (Linné).

Yellow-bellied Sapsucker.

Seven adults of both sexes, Deer Lake and Nicholsville, July 1st to 10th.

Sapsuckers were observed on many different occasions. Two broods of recently hatched young were found on July 5th and 6th respectively. Two breeding birds taken July 5th held a number of large red ants in their bills. Other parent birds observed returning to their young also had their bills stuffed with insects, probably ants.

17. COLAPTES AURATUS LUTEUS Bangs.

Northern Flicker.

A pair of adults and an immature female from Nicholsville, July 16th and 20th.

Several others were observed along the Upper Humber, but none in the other regions visited.

18. NUTTALLORNIS BOREALIS (Swainson).

Olive-sided Flycatcher.

Two adult males and one adult female from Nicholsville, July 29th to August 6th.

Other birds of this species were observed at Port au Port and Spruce Brook during the last week of August and the first week of September. A mated pair was observed at Nicholsville, July 29th, but the nest could not be found.

19. EMPIDONAX FLAVIVENTRIS (W. M. and S. F. Baird).

Yellow-bellied Flycatcher.

Eight adults of both sexes from Deer Lake, Nicholsville, and Romain's Brook, June 30th to August 27th.

This Flycatcher is very common in all wooded regions, especially in patches of second growth birch or in older thickets, so characteristic of the Upper Humber. Arnold (1912, p. 77) records both the Alder and Least Flycatcher from the Humber River region. I met with neither species. Since Arnold records the Alder Flycatcher so common, and does not mention the Yellow-bellied, it seems very probable that the bird he actually saw was the latter species. The record of the Least Flycatcher was probably also a *lapsus*.

20. OTOCARIS ALPESTRIS ALPESTRIS (Linné).

Horned Lark.

Seven adults of both sexes from the Lewis Hills, August 17th to 21st. On the rocky barrens of the Hobley and Lewis Hills, Horned Larks were often seen. They were more common than the Pipits and not so wary.

21. CYANOCITTA CRISTATA CRISTATA (Linné).

Blue Jay.

One adult male and an adult female, Romaine's Brook and Spruce Brook, August 27th and 30th.

This single pair averages slightly grayer, less brownish than New England specimens. But several New England specimens before me are nearly identical with the Newfoundland birds.

The pair of birds taken were the only Blue Jays observed during my stay in Newfoundland. It is noteworthy that they were found in the warm southwestern region.

22. PERISOREUS CANADENSIS SANFORDI Oberholser.

Newfoundland Jay.

Thirteen adults of both sexes and three immatures, from Nicholsville and the Hobley Hills, July 6th to August 7th.

As stated by Oberholser (1914, p. 49), this subspecies is intermediate between the Labrador and northern New England races, but very near to the Labrador form. The difference given by Oberholser can be observed only in a large series; any one character of the Newfoundland bird can be perfectly matched in our series of Labrador birds. Thus we may say that in the case of this Newfoundland Jay, we have a tendency toward differentiation which has just become fixed.

This Jay is ubiquitous in Newfoundland, wherever there are woods. During a day's tramp over large stretches of "Mash," bogs of *Picea mariana* Miller and *Larix laricima* (Du Roi), no birds are to be met with save the Newfoundland Jay accompanied now and then by a little flock of Acadian Chickadees. The Jays, like the Chickadees, evidently seek companionship within their families. Throughout the month of July, I found many flocks of young birds always accompanied by one or two old birds, presumably their parents.

23. CORVUS CORAX PRINCIPALIS Ridgway.

Four adults, all females, from the Lewis Hills, August 19th to 25th.

Solitary birds or small flocks were observed along the shores of Deer Lake on several occasions throughout the month of July. A flock of over thirty individuals was found to frequent a restricted area of the Lewis Hills. This was a rocky headland where the birds were accustomed to perch during the morning and evening hours.

24. CORVUS BRACHYRHYNCHOS BRACHYRHYNCHOS C. L. Brehm.

American Crow.

One young male from Port au Port, August 12th. No other Crows were observed.

25. EUPHAGUS CAROLINUS (Müller).

Rusty Blackbird.

Nine adults of both sexes from Nicholsville and Spruce Brook, July 5th to September 18th.

A large number of breeding birds were found in the marshes just east of Nicholsville. Two deserted nests were discovered. Both were in low spruces back of the wet meadow bordering the marsh. Flocks of Rusty Blackbirds passing through Spruce Brook, September 1st to 14th, were observed on several occasions to frequent the garbage cans of the "Log Cabin Hotel."

26. PINICOLA ENUCLEATOR ECHATOSUS Oberholser.

Newfoundland Pine Grosbeak.

Eleven adults of both sexes and three young males from Deer Lake, Nicholsville, Hobley Hills, Romain's Brook, and Spruce Brook, June 26th to September 13th.

Future work will probably show that this race is not really distinct from *P. e. leucura* (Müller). The eight adult males in the series show a great range of variation in the intensity of their red tones. But even the darkest and dullest individuals agree perfectly with New England birds of similar dates. Nor do I find that the females are "darker on upper and lower parts" (Oberholser, 1914, p. 51), than New England birds. There is an apparent difference ln the measurements, but this is not great. The eight adult males measure: wing 111–116 (average 113.1) mm.; tail 90–85 (89.2); exposed culmen 14.5–15.5 (14.8); tarsus 22.2–23 (22.6). The three adult females measure: wing 111–112 (111.5); tail 86.2–89 (87.9); exposed culmen 14.5–15; tarsus 22–23 (22.5). In order to determine the status of the Newfoundland Pine Grosbeak, a study of more breeding birds from Canada is essential.

The Pine Grosbeak was found in nearly all the woods where coniferous trees were scarce or wanting. The bird apparently thrives largely on berries. On several occasions, birds were surprised while eating the brilliant fruit of *Viburnum pauciflorum* Rafinesque. One bird, a beautiful red male, was watched for half an hour. It was observed to bite the fruit very carefully and slide the pulp in sidewise through its bill, in such a way that the skin and hard parts were removed and fell to the ground.

27. CARPODACUS PURPUREUS PURPUREUS (Gmelin).

Purple Finch.

Two adult males and a young female from Nicholsville, July 10th to 17th.

No others were observed, but one was heard singing at Nicholsville on July 9th.

28. LOXIA CURVIROSTRA PERCNA Bent.

Newfoundland Crossbill.

One adult male, and four young of both sexes, Nicholsville and Hobley Hills, July 10th to July 27th.

The Newfoundland Crossbill represents one of the best local races which has been described from Newfoundland. Its large bill is one its most distinguishing features.

Flocks of Crossbills were observed flying over the Humber on many different evenings. It was only on rainy days that these birds could be secured. At these times the birds flew low, and when once alighted seemed loth to leave their perch.

29. LOXIA LEUCOPTERA Gmelin.

White-winged Crossbill.

One adult and one immature male, Nicholsville, and Hobley Hills, July 20th and July 26th.

The one immature specimen is much darker than any of the juvenile specimens of the species which I have been able to study. A microscopic examination of the barbules shows that this darkness is not due to staining from balsam or dirt. The markings themselves are darker. The one adult male has a greater development of black in proportion to its warm tones than has the average bird from the mainland. Still a larger series of Newfoundland birds may show that these differences are only tendencies and not worthy of subspecific distinction.

30. SPINUS PINUS (Wilson).

Pine Siskin.

Four adult males and three immature of both sexes from Deer Lake, Nicholsville, and Port au Port, July 1st to August 31st.

This little Finch does much to enliven the vast stretches of burnt-over country which today cover so much of Newfoundland. With Lincoln's Sparrow and an occasional Woodpecker, it affords the only sign of life throughout a large part of the Upper Humber region.

31. PASSERCULUS SANDWICHENSES SAVANNA (Wilson).

Savanna Sparrow.

Six adults of both sexes from Nicholsville, Hobley Hills, Port au Port, and Lewis Hills, July 26th to August 19th.

These six specimens average somewhat darker than breeding birds from New England. The spotting of the ventral surface is richer and darker, the dorsal centers of the feathers are blacker. Labrador birds show similar peculiarities, but it is not apparent that these differences are a constant feature. If the Newfoundland birds should be found to have some constant difference from New England birds, they will have to receive the name *P. s. labradorum* Howe.

32. ZONOTRICHIA LEUCOPHRYS LEUCOPHRYS (J. R. Forster).

White-crowned Sparrow.

One immature male, Spruce Brook, September 15, 1915.

This specimen was the only White-crowned Sparrow observed throughout the trip. It was apparently a migrant.

33. ZONOTRICHIA ALBICOLLIS (Gmelin).

White-throated Sparrow.

Seven adults of both sexes from Deer Lake, June 26th to July 1st. The White-throated Sparrow was seen in nearly all the lowlands visited. It is replaced on the high barren lands by the Savanna Sparrow. Both Sparrows breed commonly.

34. JUNCO HYEMALIS HYEMALIS (Linné).

Junco.

Three adults and three immatures of both sexes from Nicholsville, Port au Port, and Spruce Brook, July 5th to September 18th.

The Junco like many other Newfoundland birds shows a tendency towards darkness. This is especially noticeable in young birds which have assumed their first plumage. The dark spots on the feathers are broader and blacker than in New England birds of the same age. There is apparently no constant difference in the adults from Newfoundland and the mainland.

The Junco does not breed at all commonly in Newfoundland. Few were observed besides those collected, and none at different localities.

35. MELOSPIZA LINCOLNI LINCOLNI (Audubon).

Lincoln's Sparrow.

Eight adults of both sexes and one young male from Deer Lake, Nicholsville, and Spruce Brook, June 28th to September 10th.

Lincoln's Sparrow is the commonest bird about all the Newfoundland clearings. I found it fearless, almost confiding, during the last week of June and the first of July. A nest with partly fledged young was found June 27th.

36. MELOSPIZA GEORGIANA (Latham).

Swamp Sparrow.

Seven adults of both sexes and one immature male from Spruce Brook and Lewis Hills, August 19th to September 18th.

This species was met with only as a migrant. It may possibly breed at the foot of the Lewis Hills, but my observations do not bear this out. I did not find it at all along the Humber.

37. PASSERELLA ILIACA (Merrem).

Fox Sparrow.

Seven adults of both sexes and one immature male from Deer Lake and Nicholsville, June 26th to July 17th.

These seven adults which were taken at the height of the breeding season average grayer than mainland birds. This tendency is not a constant difference.

The Fox Sparrow was found abundantly everywhere except on the high barrens.

38. Iridoprocne bicolor (Vieillot).

Tree Swallow.

Five adults of both sexes from Nicholsville, July 5th to July 21st.

Tree Swallows were found breeding in the immediate vicinity of Nicholsville. When the young were out of the nests, both young and old would perch on a telegraph wire overhanging the Upper Humber. It was only at this point that large flocks were observed.

39. Mniotilta varia (Linné).

Black and White Warbler.

Two adult males and an adult female from Deer Lake, Nicholsville, and Lewis Hills, June 30th to August 24th.

The Black and White Warblers of Newfoundland are apparently darker than New England breeding birds. The white areas are narrower and the black ones broader. But, again, this darkness is not always a constant feature, since some of the New England specimens are nearly identical, or at least fall within the range of our small series.

Other birds of this species were observed at Nicholsville, July 2nd to 10th. This bird was not abundant in the region traversed.

40. Dendroica aestiva amnicola Batchelder.

Newfoundland Yellow Warbler.

Four adult specimens from Deer Lake, Nicholsville, and Lewis Hills, July 3rd to August 25th.

This well-marked subspecies was found in a somewhat different habitat than *D. a. aestiva* (Gmelin) of Nova Scotia. Instead of frequenting the bushy brooksides, as its subspecific name would imply, the bird seemed to prefer the tall stands of deciduous trees. I became very familiar with this Warbler in the woods on the north side of Deer Lake, but I did not meet with it at all around any of the many bushy swamps which extend over so much of Newfoundland.

41. Dendroica coronata (Linné).

Myrtle Warbler.

Five adults of both sexes from Nicholsville and Spruce Brook, July 8th to September 16th.

Since no other specimens were observed, the Myrtle Warbler cannot be a very common bird in Newfoundland.

42. Dendroica magnolia (Wilson).

Magnolia Warbler.

Two pair of adults and a young male from Deer Lake, Nicholsville, and Port au Port, June 26th to August 12th.

Magnolia Warblers were seen on several other occasions throughout the month of July. It is a fairly common species.

43. Dendroica striata (J. R. Forster).

Black-poll Warbler.

Five adults of both sexes from Nicholsville, Port au Port, and Lewis Hills, the dates ranging through July and August.

This Warbler was found to be a common breeding bird. Singing males were observed frequently between the dates of June 26th to July 10th.

44. Dendroica virens (Gmelin).

Black-throated Green Warbler.

Three adult males from Spruce Brook and Nicholsville.

No other birds of this species were observed.

45. Seiurus aurocapillus furvior Batchelder.

Newfoundland Oven-bird.

Four adults of both sexes from Nicholsville, Romain's Brook, and Spruce Brook, July 20th to September 1st.

This dark race of Oven-bird frequents the very densest woods. It was indeed surprising to find the Oven-bird in such damp situations. On many occasions throughout the month of July, I heard the ringing call of the Oven-bird arising from impenetrable masses of stunted spruce and juniper. It would be interesting to know if this dark, damp environment has not had some direct influence on the change of coloration of this subspecies.

SEIURUS NOVEBORACENSIS NOVEBORACENSIS (Gmelin).

Water Thrush.

Eight adults of both sexes from Deer Lake and Nicholsville, June 26th to August 3rd.

Water Thrushes were found abundantly in all the wooded regions, especially in the vicinity of streams.

47. OPORORNIS PHILADELPHIA (Wilson).

Mourning Warbler.

Six adults of both sexes from Nicholsville, Port au Port, and Spruce Brook.

Although this bird was not abundant, it was seen on several other occasions throughout the month of July.

48. GEOTHLYPIS TRICHAS BRACHIDACTYLA (Swainson).

Northern Yellow-throat.

Two adult females from Lewis Hills and Spruce Brook, August 25th to September 10th.

Both of these specimens are distinctly darker than any fall birds of this species from the mainland. But knowing how many other Newfoundland birds show only tendencies toward a darkening, I do not feel inclined, without further material, to describe the Newfoundland bird as a race.

49. WILSONIA PUSILLA PUSILLA (Wilson).

Wilson's Warbler.

Six adults of both sexes from Deer Lake, Nicholsville, and Spruce Brook.

Others were observed everywhere in the lowlands from June 25th to September 14th. The Black-poll and Wilson's Warbler are the commonest warblers in Newfoundland.

50. SETOPHAGA RUTICILLA (Linné).

Redstart.

Three adult males, Deer Lake and Nicholsville, July 1st to 20th.

These three males show a greater extension of their black areas than most of the mainland birds examined. Some specimens, however, are so nearly alike that no distinction can be made between them.

The Redstart was found only in the Humber River region. Here there are many deciduous woods, which together make up the favorite haunts of the bird.

51. ANTHUS RUBESCENS (Tunstall).

Pipit.

Two youngish birds, one from the Hobley Hills, July 24th, and the other from the Lewis Hills, August 21st.

The high barren grounds of the Hobley and Lewis Hills form an ideal home for the Pipit. Several flocks were seen in these regions.

52. NANNUS HIEMALIS HIEMALIS (Vieillot).

Winter Wren.

One adult female and five youngish specimens of both sexes from Nicholsville, Port au Port, Lewis Hills, and Spruce Brook, the dates ranging through the whole summer.

The one adult female is distinctly darker than any specimens from Maine and New Brunswick which I have examined. Without a large series, it would be difficult to determine whether or not this tendency is worthy of subspecific distinction.

The Newfoundland Oven-bird and Winter Wren are the only inhabitants of the dense and soaking undergrowths which choke most Newfoundland valleys. The sharp crescendo of the first and the bubbling warble of the second ring out in pleasing contrast. These notes were heard on many occasions, but the songsters seldom came into view.

53. Sitta canadensis Linné.

Red-breasted Nuthatch.

One adult female from the Lewis Hills, August 17th. No others were seen or heard.

54. Penthestes atricapillus atricapillus (Linné).

Black-capped Chickadee.

Eleven adults of both sexes, and three young birds, Nicholsville, Port au Port, Lewis Hills, and Spruce Brook, July 6th to September 18th.

The adults in this series vary considerably among themselves, but they average browner, less gray above, than mainland birds. The buff of the sides is conspicuously richer. In size they are nearly identical with mainland specimens. We would expect in a region fostering specialization, such as Newfoundland, that the Black-capped Chickadee would be represented by a geographical race, but I have been unable to find one distinguishing character to separate the Newfoundland bird.

Little families of Black-capped Chickadees were met with on many of my tramps through the more open woods. The younger birds of the family would be just as excited as their parents at my "squeaking." These family groups became more disintegrated during the latter part of August. At least at that time, I searched in vain for fully adult birds in such groups.

55. PENTHESTES HUDSONICUS LITTORALIS (H. Bryant).

Acadian Chickadee.

Six adults and six youngish birds of both sexes from Deer Lake, Nicholsville, Hobley Hills, Port au Port, and Spruce Brook, July 3rd to September 16th.

One of the surprises in studying the collection was to find that the brown Chickadee of Newfoundland was typical *P. h. littoralis* and not *P. h. nigricans* C. W. Townsend of the nearby Labrador coast. Our specimens are indistinguishable from specimens from Nova Scotia and Maine, and very different from the type of the latter race.

It has been mentioned above that the Newfoundland Jay and the Acadian Chickadee make up a large part of the avifauna of the Newfoundland "Mash." The Chickadee was found abundantly in the coniferous trees surrounding these bogs.

56. REGULUS CALENDULA CALENDULA (Linné).

Ruby-crowned Kinglet.

Four adult males and one adult female from Nicholsville and Spruce Brook, July 7th to September 10th.

The Ruby-crowned Kinglet was observed very often in the deciduous woods east of Nicholsville. It was apparently breeding there. Only occasional birds were seen elsewhere.

57. HYLOCICHLA FUSCESCENS SALICICOLA Ridgway.

Willow Thrush.

Eight adults of both sexes and one immature male from Romain's Brook, Port au Port, Lewis Hills, and Spruce Brook.

Newfoundland "Veerys" are identical with specimens from Montana, Minnesota, and British Columbia.

H. f. fuliginosa Howe, (1900, p. 271), must be considered synonymous with the Willow Thrush. In size as well as in coloration, both adults and immatures agree perfectly with the western bird.

The Newfoundland "Veery" was observed only in the rich limestone areas of the southwest. I never met with it at all in the woods covering the sandstones and shales of the Upper Humber. As pointed out (p. 544), the limestone areas support many plants known elsewhere from western America only. This would seem to indicate a correlation between bird and plant life.

58. Hylocichla aliciae aliciae (Baird).

Gray-cheeked Thrush.

One adult female from Nicholsville, July 8th.

I made a special effort to find other specimens of this species, but never succeeded. The bird must be very rare in Newfoundland, at least in the regions visited.

59. Hylocichla ustulata swainsoni (Tschudi).

Olive-backed Thrush.

Thirty specimens of both sexes from Deer Lake, Nicholsville, and Hobley Hills, June 27th and throughout the month of July.

The Olive-backed Thrush is by far the commonest thrush in Newfoundland. It apparently prefers the drier woods, especially those in which clearings have been made.

60. Hylocichla guttata pallasi (Cabanis).

Hermit Thrush.

Fifteen specimens of both sexes from Nicholsville and Spruce Brook.

Newfoundland birds of this species average slightly darker and grayer than breeding birds from New England. The markings of the breast are slightly blacker. But since certain specimens from New England approach in coloration very closely to Newfoundland birds, it seems advisable to consider these differences as tendencies rather than characters distinctive of a geographic race.

The Hermit Thrush is often found in company with the Olive-backed, but it seems to prefer the water more than the latter species. Just at dusk, many Hermit Thrushes were always to be found along the edge of the Humber. They would dart out after some passing insects and then drop back to the shore. Most of the specimens in the above series were collected from a canoe which I paddled close to the shore during twilight hours.

61. Planesticus migratorius migratorius (Linné).

American Robin.

Two adult males and three adult females, Deer Lake, Nicholsville, and Port au Port.

As with the Northern Yellow-throat, this limited series shows a decided tendency towards a darkening of the coloration. But here again, it seems advisable not to describe a race because our knowledge of the complete range of variation in Newfoundland and mainland birds is limited to so small a series.

Robins were observed abundantly only in the vicinity of dwellings. On the lawns near Deer Lake Station, they were seen almost every day.

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REGENERATIVE PHENOMENA FOLLOWING THE REMOVAL OF THE DIGESTIVE TUBE AND THE NERVE CORD OF EARTHWORMS.

By H. R. Hunt.

With One Plate.

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No. 15.— *Regenerative Phenomena following the Removal of the Digestive Tube and the Nerve Cord of Earthworms.*

By H. R. Hunt.

CONTRIBUTIONS FROM THE ZOÖLOGICAL LABORATORY OF THE MUSEUM OF COMPARATIVE ZOOLOGY AT HARVARD COLLEGE. NO. 317.

In recent years much interest has been shown among zoölogists in attempts to determine the degree of interdependence among the parts of a developing organism. On the one hand, some developing structures are independent of others (self-differentiating). On the other hand, the development of one part may depend upon a "formative stimulus" (Herbst) from another part. For instance, the relation of differentiated nervous tissue to the processes of regeneration and ontogeny has been the subject of much controversy. Nervous stimuli were formerly believed to be important in the regenerative and normal developmental processes of embryos, as well as in the regeneration of adults. It has now been demonstrated, however, that in ontogeny nervous stimuli play no important morphogenetic rôle.

But numerous investigators (Herbst, Przibram, Morgan, Wolff, Walter, and others) have maintained that regeneration in adults is modified or inhibited in the absence of specific relation of the regenerating parts to nervous tissue. Others, notably Goldfarb ('09, '14), have insisted that regeneration in adults is totally independent of nervous stimulation. Using modified methods, Goldfarb repeated Morgan's ('02) experiment of removing the nerve cord from the anterior end of a beheaded earthworm, and found that it was possible for the worm to regenerate a normal head while the cut end of the old nerve cord was still several segments back of the regenerating region. In other words, the regeneration of the earthworm's head is not contingent upon nervous stimuli.

As a further line of attack upon this problem of interdependence of organs in regeneration, Goldfarb's results suggested removing from the cut surface of a beheaded earthworm some organ not a part of the central nervous system, such as the digestive tube. Following such an operation, the regeneration of a normal head before the digestive tube had grown forward to the level of transection would demonstrate that the development of the new head was independent of any mechanical support or stimulation furnished by the tube. A still more rigorous test of the capacity for self-differentiation of the cephalic organs would be provided by removing *both* the digestive tube and nerve cord at the anterior end.

Accordingly, the present investigations were undertaken to determine whether the structures near the anterior end of an earthworm can regenerate when (1) the digestive tube, and (2) the digestive tube and nerve cord are absent in this end. For convenience these two groups of experiments will be discussed separately.

The histological changes involved in the normal regeneration of the Annelida have been worked out in considerable detail (Hescheler, '98; Michel, '98; Nusbaum, '02 and '04; Rand, '01 and '05; von Wagner, '00; Zielinska, '09; and others).

1. First Group of Experiments.

Materials and Methods.

The worms were anaesthetized in an aqueous solution of chloretone or in carbon dioxide. The three or four most anterior segments were cut off. Then, with a fine pair of scissors, a longitudinal incision was made in the body wall on the dorsal side, and the digestive tube excised from about five segments at the anterior extremity of the remaining piece. Each operated worm was kept in a cold room in a Stender dish and on clean, moist filter paper. This series included two hundred and nine worms. Of these, one hundred and seventy-seven belonged to the species *Eisenia foetida*, and thirty-two to the species *Helodrilus caliginosus*. Seventy-six worms survived the operation. Each one of these was killed and sectioned sagittally when it showed a small regenerated knob or cone at the operated end, or when it seemed probable that sufficient time had elapsed since the operation for regenerative processes to have proceeded to the desired extent internally. The animals were always thoroughly anaesthetized, by one or the other of the methods indicated, before the anterior portion was cut off and immersed in the fixative. This anaesthetization minimized the possibility of distortion of the regenerated structures by muscular contraction when the tissues came in contact with the fixing fluid.

Several animals from which merely the three or four head segments were removed by a transverse cut served as controls.

Number 66. Helodrilus caliginosus (Savigny). The three most anterior segments had been removed and the digestive tube cut out from five segments more. The worm was killed sixty-one days after the operation. At this time a knob of regenerated tissue was observed externally at the anterior end of the body. A study of the sections showed that the knob possessed the characteristics of regenerated tissue (Fig. 1). The digestive tube (*trt. in.*) had grown forward so that its anterior end was imbedded in the mass of cells inside the knob. A thickening of the epithelium lining the dorsal side of the tube at its anterior end suggests that the process of forming a pharynx had begun. Brain (*cb.*) and connectives were regenerating. A horizontally elongated stomodeum (*stmd.*) had developed. Seven other worms showed practically the same phenomena as number 66.

In fourteen worms the digestive tube had regenerated so far forward that the lumen had come into communication with the outside, while the fundaments of the brain and connectives also had reformed. These twenty-two cases prove conclusively that after an operation of this kind the alimentary canal can grow forward to the anterior end, and the process of regenerating a head can proceed, in its main aspects at least, in a normal way.

However, six other operated worms, described below, furnished much more interesting and instructive phenomena, in that they showed the regeneration of head structures *before* the digestive tube had grown forward.

Number 67. Helodrilus caliginosus. The three most anterior segments of the body were cut off and the digestive tube excised from the next four segments. Thirty-eight days later a cone of regenerated tissue was observed at the anterior end; consequently the worm was then killed. The cut end of the digestive tube had closed and was covered by epithelium. This end was distant from the anterior end of the worm a little more than the length of three segments. A columnar epidermis, possessing a cuticula, covered the surface of the cone-shaped mass of regenerated tissue (Fig. 2). Regenerated circular (*mu. crc.*) and longitudinal muscle fibers (*mu. lg.*), of smaller diameter than those in the old part of the body, occurred in their normal positions in the cone.

A brain (*cb.*) was found dorsal to the anterior end of the nerve cord in the regenerated tissue. A pair of connectives joined this brain with the ventral nerve cord (*n.v.*). The brain was certainly a regenerated structure, for great care was taken after each operation to make sure that the original brain had been removed. The regenerated brain consisted of a central region, containing relatively few cells, and a peripheral region, composed of closely packed cells which partially surrounded the central mass. The brain periphery was not sharply demarked from the surrounding tissue. A pair of regenerated nerves ran forward, as in the normal worm, from the base of the brain. One nerve ended at the deep boundary of the epidermis on the dorsal wall of the invagination described below. Both of them plainly showed a fibrous region, which stained like the central part of the brain.

A deep, horizontally elongated invagination (*stmd.*) occurred near the tip of the regenerated cone. Three lines of evidence clearly showed that it was a stomodeum. (1) It had the characteristic shape of a stomodeum. In a horizontal direction its greatest dimension was about sixteen times that in the plane (sagittal) of the sections. Median sections of the invagination resembled the median section of a funnel. Stomodea in the control animals had approximately the same shape. (2) It occurred in the normal position for a stomodeum, *i. e.*, near the tip of a regenerated cone, with its antero-posterior axis pointing toward the nerve ring formed by the brain, the connectives, and the ventral nerve cord. (3) It is very highly improbable that such a deep, slit-like infolding could be merely a wrinkle, in the new epithelium, caused by the contraction of the regenerated circular muscles when the worm was killed. The invagination probably could not have been produced in this way unless the surface of the regenerated region were originally flat or concave, whereas, owing to internal pressure of the body fluid it must have been more or less convex, so that any contraction of the regenerated circular muscles would most likely have caused an elongation, instead of a buckling inward, of the cone. The infolding was certainly a stomodeum.

Number 359. Eisenia foetida (Savigny). Thirty days after the operation the closed digestive tube was five segments from the healed anterior end of the worm. At this end an invagination was found in the regenerated tissue. The close proximity of this infolding to the regenerating end of the nerve cord, its shape (as compared with stomodea in the regenerating control animals), and the absence of any evidence that it could have resulted from muscular contractions, clearly indicate that it was a stomodeum. It is a significant fact that this stomodeum developed, not only in the absence of the digestive tube at the regenerating end, but *before the brain and connectives had formed.*

Number 77. Eisenia foetida. The closed digestive tube after fifty days was about the length of four segments from the healed anterior end of the body. A brain had regenerated, which was joined with the ventral nerve cord by abnormally short connectives. The sagittal sections of the brain were less than half the average size of corresponding brain sections from four normal animals of the same species.

Number 294. Eisenia foetida. This case resembled number 77 in every essential respect, but differed from it in the following details. In median section the brain was only about one fourth as large as a normal brain. The regenerated connectives were longer and slenderer than in number 77, and one nerve had begun to grow forward from the regenerating brain.

Number 291. Eisenia foetida. Fifty days after operation the worm had regenerated a colorless, blunt, anterior region, which was divided externally into three or four segments (Fig. 3, A to B). The drawing was made while the worm was under the influence of the anaesthetic. The furrows were certainly intersegmental grooves and not the results of muscular contraction in the regenerated region, for the muscles must have been relaxed under the influence of the anaesthetic. A study of the sagittal sections also shows the segmented character of the new tissue, for the intersegmental grooves could be traced down one side of the animal, across the ventral surface, and up the other side. In many places the epidermis at the bottom of these grooves was, as in normal intersegmental grooves, distinctly thinner than elsewhere. The digestive tube was about three segments posterior to the place where the regenerated tissue began. A thin layer of slender circular and longitudinal muscle fibers had regenerated in the normal positions for such fibers. The new brain and connectives united in normal fashion with the nerve cord, although sections of the brain were only about one fourth as large as corresponding sections of the normal brain. This case is unique because it demonstrates that segment formation is independent of the close proximity of the digestive tube to the regenerating region.

Number 272. Eisenia foetida. The digestive tube was about five segments from the regenerating end of the body after fifty-four days. An invagination in this regenerated tissue was clearly a stomodeum (Fig. 4, *stmd.*). This was demonstrated by its normal shape (as compared with the stomodea in controls), its position (in regenerated tissue with its axis pointing toward the nerve ring formed by the connectives, brain, and nerve cord), and by the complete absence of evidence that it was produced by muscular contractions. The regenerated brain (*cb.*) was joined with the ventral nerve cord by abnormally short connectives.

There was some doubt in the preceding cases whether the cut which removed the brain and the three anterior segments, also removed the end of the nerve cord and the bases of the connectives. This doubt was suggested by the fact that in some of these cases the hyaline nerve sheath passed around the end of the nerve cord, as normally, while in the other cases the absence of the sheath could not be demonstrated. But in number 272 the sheath (Fig. 4, *lem. hyl.*) clearly terminates a considerable distance back of the bases of the connectives. It is conceivable, of course, that the anterior part of the old sheath had degenerated, but I found no evidence of it. It is therefore probable that the regenerating end of the nerve cord bifurcated to form the connectives and did so without being stimulated by contact with the digestive tube.

These six cases clearly demonstrate that the regeneration of the connectives, of the brain and its two main nerves, of the stomodeum, and of the segmented muscular body wall, can proceed in the absence of any stimuli depending upon the close proximity of the digestive tube.

2. Second Group of Experiments.

The observations of Goldfarb show that regeneration in the earthworm (**'09**) and the annelid *Amphinoma pacifica* (**'14**) was not contingent upon contact with, or stimulation from, the nerve cord or central nervous system. These observations, in connection with those described above, suggested the possibility that if *both* the nerve cord and the digestive tube were excised, head structures might regenerate before either tube or cord had grown forward to the anterior end. The operation described in the first group of experiments was repeated on one hundred and three individuals of *Eisenia foetida*, and, in addition, in each of these worms the nerve cord was removed from the first five or six segments back of the plane in which the body was transected.

Sixty-nine individuals survived the operation. I found no cases in which head structures had regenerated before the nerve cord and digestive tube had grown forward to the anterior end. But the failure of the head to regenerate under these conditions may have been due to the two following causes. In the first place, the wounds healed normally and completely in only twenty of the worms. Secondly, but nine of these twenty showed positive evidence of any regenerative activity. The low temperature at which the worms were kept seems to have retarded regeneration. (The nerve cord was used as an index of such activity, because one can recognize regenerated tissue more easily in the cord than in the digestive tube). Thus an unfortunate combination of unsatisfactory wound healing and a very slow rate of regeneration, rather than the absence of alimentary canal and nerve cord at the head end, may have been responsible for the failure of head structures to regenerate as expected. However, the experiments furnished significant results.

In one animal the nerve cord and digestive tube had grown forward to the anterior end in thirty-nine days after the operation. The tube was open to the outside and its dorsal wall in the anterior region was lined by a thickened ciliated epithelium, indicating that the pharynx had reformed. A new brain was situated dorsal to the anterior end of the digestive tube, and the connectives, encircling the tube in the normal way, united the brain with the forward end of the regenerated nerve cord. This case clearly shows that the forward regeneration of the cord and alimentary canal is not conditional upon the close proximity of regenerating cephalic structures.

Another interesting phenomenon was found in five worms from this group of experiments. A detailed description of one of the five cases, number 433, will suffice.

Three anterior segments were removed from this worm, then the digestive tube and the nerve cord were cut out from the five succeeding segments. There was no external evidence of regeneration at the end of fifty-eight days. The anterior extremities of both alimentary canal and ventral nerve chain were a little more than four segments from the front end of the body. A strip of scar tissue extended antero-posteriorly along the dorsal side of the worm, where the longitudinal cut had healed. Just dorsal to the end of the digestive tube a long, slender invagination extended from the scar tissue ventrally across the front of the tube (Fig. 5, *ivg.d.*). The invagination did not open into the alimentary canal (*trt.in.*), though long enough to do so. A plainly visible cuticula over most of the surface of the lumen and the arrangement of nuclei around the invagination showed that it doubtless had an epithelial lining.

The relation between the invagination and the nerve cord was suggestive. Two slender prolongations of the fibrous region of the cord occurred at its anterior end. The length, position, and shape of branch *a* (Fig. 5) shows that it was probably composed of regenerated material. This branch lay between the digestive tube and the invagination. The irregular contour of the anterior end of the cord suggests that branch *c* may have been produced by a partial degeneration of this end, though the possibility of its being a regenerated structure is not excluded. No regenerated brain was present.

The conditions in the other four worms closely resembled those in number 433, except in the following details. In two of the four cases the slender regenerated end of the nerve cord turned upward toward the invagination, but along one side of the digestive tube instead of in front of it. In one case the invagination branched twice dichotomously. In another worm there were two invaginations from the scar tissue on the dorsal side, exclusive of the one whose inner region was closely associated with the ends of the nerve cord and digestive tube — three invaginations in all.

These pouches were not due primarily to abnormalities in healing at the anterior end of the body, for in one of the five cases the worm healed completely and normally. Moreover, they were altogether too long and too slender to have been produced by muscular contractions.

3. Discussion and Conclusions.

The observations in the second group of experiments will be discussed first.

The upward regeneration of the nerve cord and the downward development of the ectodermal pouch strongly suggest that these invaginations are stomodea representing abortive attempts to regenerate a head on the dorsal side. Alluring as this hypothesis may be, there are several valid objections to it. (1) The brain is absent in all cases and the connectives can not be demonstrated conclusively. (2) None of the invaginations have the slit-like form which I observed in normal stomodea. (3) The invaginations did not open into the alimentary canal, though in three of the worms they were long enough to do so. (4) One of the pouches branched twice dichotomously. (5) In one worm several invaginations were present in the cicatrix on the dorsal side, but normally only one stomodeum forms in a regenerating worm.

The dorsal pouch appeared only in cases where the nerve cord as well as the digestive tube had been excised from the anterior extremity of the operated worm. It was not found in the sixty-seven cases in which only the digestive tube was removed. In each of the five cases the nerve cord regenerated dorsally, coming into intimate association with the invagination. These facts strongly suggest that the developing invagination was the source of a stimulus which acted upon the cord and determined its direction of growth, and also that the cord may have exerted a similar influence upon the invagination.

These pouches may be abnormally located stomodea, but at present all we can say is that there seems to be some reciprocal formative relationship between them and the regenerating nerve cord.

The experiments described in the first group show that the anatomical units of the earthworm's body exhibit a striking degree of independence of each other in anterior regeneration.

But the action of hormones was not excluded by the methods of experimentation. Possibly the regenerating alimentary canal produced substances which were carried forward to the anterior end and there played a necessary part in the regeneration of head structures. Likewise, these developing head structures may have affected the transected end of the digestive tube in a similar way. It would be hard to determine the rôle of hormones in these experiments, for even if one could experimentally produce a living animal deprived of its alimentary canal (I was unsuccessful in this attempt), and then could observe the regeneration of the head in such a worm, there would still be the possibility of hormone action, for hormones produced by the alimentary canal during the normal life of the worm might persist in the remaining tissues.

However, the experiments did eliminate several possible mechanical factors. The anterior region of the nerve cord and digestive tube can be reformed when the transected ends of these organs are several segments away from the front end of the body. Consequently forward growth of the tube and nerve cord does not depend upon mechanical stimulation of these organs by the regenerating parts at the anterior end of the body.

Conversely, the replacement of a head is not contingent upon mechanical stimulation or support furnished the regenerating cephalic organs by the alimentary canal, as the following facts show. (1) The brain and connectives do not need the presence of the digestive tube as a sort of supporting scaffolding around which to rebuild themselves. (2) The bifurcation of the regenerating nerve cord to form the connectives is probably independent of any stimulus due to contact with the digestive tube. (3) In normal regeneration a lump or cone of new tissue develops at the regenerating end. This enlarges and grows outward, ultimately forming normal segments. The experiments show that this outward growth is not conditional upon pressure exerted by the alimentary canal. (4) It is conceivable that the stomodeum in a regenerating worm is formed by a backward pull exerted, by some mechanism inside the body, upon the epidermis covering the regenerated tissue. But the end of the digestive tube is certainly not a necessary part of any such mechanism. (5) Also the brain and connectives are eliminated as possible mechanical agencies in the formation of the stomodeum, for in one animal (number 359) the latter appeared before the brain and commissures had developed.

4. Summary.

1. Following the excision of the anterior region of the nerve cord and digestive tube from a beheaded earthworm, these parts may regenerate, thereby restoring the normal structure of the head.
2. The regeneration of the alimentary canal and nerve cord is independent of mechanical stimuli or support provided by either cicatrix or regenerating body wall at the anterior end of the worm.
3. What may have been an abortive attempt to regenerate a head on the dorsal side of the body was observed in worms from which the anterior regions of both nerve cord and digestive tube had been removed.
4. The development of a stomodeum is not contingent upon the presence of brain and connectives.
5. The following structures can regenerate independently of any mechanical stimulation or support furnished by the digestive tube:
    - a. Stomodeum.
    - b. Connectives and brain.
    - c. A region of segmented body wall containing longitudinal and circular muscles.

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EXPLANATION OF THE PLATE.

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ABBREVIATIONS.

cb. — brain.
e'drm. — epidermis.
ivg. d. — dorsal invagination.
lem. hyl.— hyaline sheath.
mu. crc. — regenerated circular muscles.
mu. lg. — regenerated longitudinal muscles.
n. v. — ventral nerve cord.
stmd. — stomodeum.
trt. in. — digestive tube.

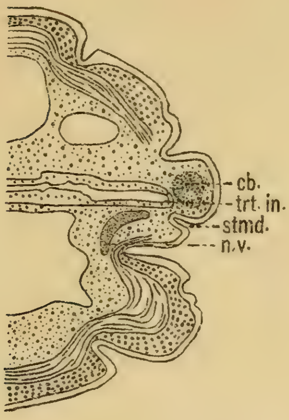
Figure 1. Worm 66. Helodrilus caliginosus. Camera lucida sketch, × 12. The regenerated tissue lacks longitudinal and circular muscle fibers.

Figure 2. Worm 67. Helodrilus caliginosus. Camera lucida sketch, × 13.5. Brain, muscle fibers, and stomodeum have regenerated. The regenerated tissue extends from a to c.

Figure 3. Worm 291. Eisenia foetida. Free-hand sketch of the anaesthetized worm made just before killing. The regenerated, segmented section of the body is shown between A and B.

Figure 4. Worm 272. Eisenia foetida. Camera lucida sketch, × 16.5. The regenerated tissue lacks muscle fibers. Regenerated brain, stomodeum, and nerve cord are shown. Note that the hyaline sheath (*lem. hyl.*) terminates some distance from the end of the nerve cord.

Figure 5. Worm 433. Eisenia foetida. Camera lucida sketch, × 15. The anterior region of both nerve cord and digestive tube were excised. Note the dorsal invagination (*ivg. d.*) and its intimate relation with the regenerating nerve cord and digestive tube. Branches a and c of the ventral nerve cord were not found in the same sections; therefore c is drawn with a dotted line.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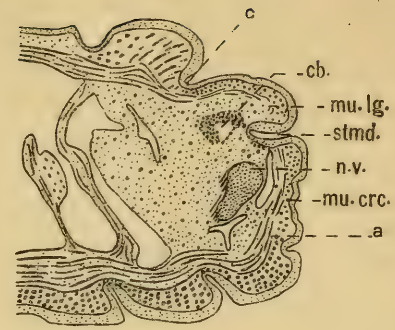
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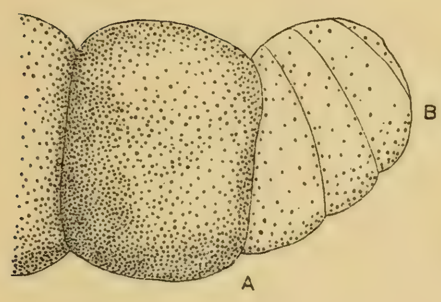
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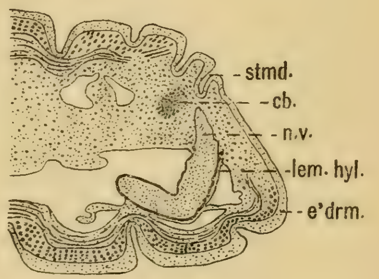
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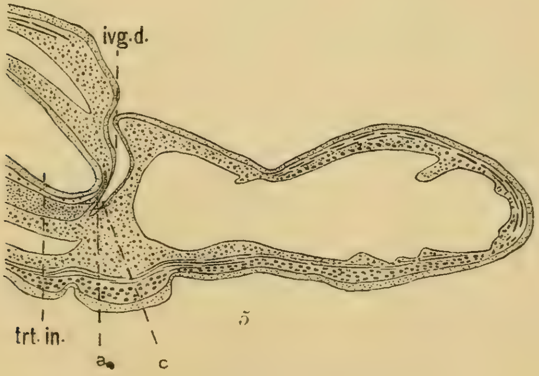
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